U.S. NATIONAL ARBORETUM

ANNUAL REPORT

1979

AGRICULTURAL RESEARCH SERVICE

U.S. DEPARTMENT OF AGRICULTURE

U.S. NATIONAL ARBORETUM
WASHINGTON, D.C.

U. S. DEPARTMENT OF AGRICULTURE
SCIENCE AND EDUCATION ADMINISTRATION
AGRICULTURAL RESEARCH
U. S. NATIONAL ARBORETUM

1979

DIRECTOR'S OFFICE
John L. Creech, Ph. D.; Director
Gladys S. Richards; Secretary to the Director

ASSISTANT TO THE DIRECTOR'S OFFICE
Marion C. Carter; M.S.; Assistant to the Director
Georgia S. Barton; Secretary
Nancy M. Cronin; Budget and Personnel
Tolatha B. Roane; Receptionist

FACILITIES AND MAINTENANCE
Marion W. Scarborough; Manager
Thurman J. Dade; Maintenance Supervisor
Margaret E. Brady; Procurement
Junior A. Peterson; Maintenance Gardener

EDUCATION, INFORMATION AND LIBRARY
Erik A. Neumann, M.S.; Technical Information Specialist, Curator of Education
Mary Ann Jarvis; Program Assistant
Ann Juneau, B.A.; Librarian

PLANT COLLECTIONS AND PLANT EXCHANGE
Sylvester G. March; Horticulturist
Vacancy; Plant Propagator
Loring I. Benedict, B.S.; Greenhouse and Gardens
Robert F. Drechsler, B.S.; Curator, National Bonsai Collection
Susan R. Frost, B.S.; Curator, Gotelli Conifer Collection
Ronald L. Bare, B.S.; Curator, Azalea-Rhododendron Collection
Ernest J. Luskey; Curator, Camellia Collection-Garden Club of America Planting
Lynn R. Batdorf; Curator, Boxwood-Daylily Collection
Craig T. Keys; Gardener-in-Charge, Fern Valley-Daffodil Ivy Planting
Andrew Ford; Gardener-in-Charge, Francis King Dogwood Garden
James A. Rogers; Gardener-in-Charge, Administration Building Gardens

PLANT DOCUMENTATION AND LABELING
Roland M. Jefferson, B.S.; Botanist
Sherrill Sasser, B.S.; Surveying and Drafting
Vacancy; Plant Recorder
Moses J. Bishop; Plant Labeling and Signs
Bobby L. Anderson; Plant Labeling and Signs

ARBORETUM RESEARCH

Nomenclature and Taxonomy of Cultivated Plants

Frederick G. Meyer, Ph. D.; Supervisory Botanist, Arboretum Herbarium
Theodore R. Dudley, Ph. D.; Research Botanist, Curator of Type Collection
Roland M. Jefferson, B.S.; Botanist
Peter M. Mazzeo, B.S.; Botanist
James McClammer, M.S.; Herbarium Assistant (Resigned 8-25-79)
Teresa Ayers, B.S.; Museum Aid (Reported 12-30-79)

Cytogenetics, Breeding and Evaluation of Shade Trees

Frank S. Santamour, Jr., Ph. D.; Research Geneticist
Gene K. Eisenbeiss, B.S.; Horticulturist
Harold E. Vettel, B.S.; Biological Technician (Biochemistry)

Cytogenetics, Breeding, and Evaluation of Ornamental Shrubs

Donald R. Egolf, Ph. D.,; Research Horticulturist
Anne O. Andrick; Research Technician
Robert F. Pritchard, B.A., Research Assistant

Breeding and Cytogenetics of Woody and Herbaceous Ornamentals

William L. Ackerman, Ph. D.; Research Horticulturist
Margot Williams, M.S.; Horticulturist

COOPERATIVE SERVICES

National Capital Area Federation of Garden Clubs, Inc.

Mrs. Edward W. Geer, Jr.; President
Mrs. Gilbert Tracy; Manager, Federation Hdqtrs. and Garden Center
Mrs. Judson C. French; Chairman, Guide Service
Mrs. William Cassell; Activity Center Gift Shop

Friends of the National Arboretum

Frank P. Cullinan, Ph. D.; Trustee
Mrs. Elizabeth C. Rea; Trustee
Robert F. Lederer; Trustee

Arboretum Collaborator

Henry T. Skinner, Ph. D.

U. S. NATIONAL ARBORETUM ADVISORY COUNCIL
October 1978 - 1980

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Las Cruces, New Mexico

*Dr. Hugo O. Graumann retired

REPORT OF THE U.S. NATIONAL ARBORETUM
for the period January - December 1979

prepared for the meeting of the
National Arboretum Advisory Council
April 15-16, 1980

INTRODUCTION

The Calendar Year 1979 was a complex one for the U.S. National Arboretum. In these times of an energy crisis and inflation, the ability of Arboretum staff to function effectively is taxed to the utmost. However, even under present limitations of funds and personnel, a high standard of excellence in research and education is still our goal. As the report demonstrates, progress in both research and education is noteworthy and despite the many limiting factors under which we must operate, new developments are identified by all units.

In the botanical area, expansion of the Herbarium continues unabated. A record number of 15,455 specimens were mounted and added to the permanent herbarium collection, with major emphasis on remounting of the Isaac C. Martindale Herbarium, a 19th Century collection consisting of some 80,000 specimens. Dr. Meyer's field survey to document ornamental trees, shrubs, and woody vines of southeastern United States has now covered parts of every southern state except Arkansas. About 6,000 collections have been made by Dr. Meyer and Mr. Mazzeo since the project started in 1968. The goal is a comprehensive book on the cultivated woody plants of southeastern U.S. The work by Dr. Meyer in collaboration with Dr. Emily Trueblood and The Herb Society of America to publish a facsimile edition of the 16th century herbal, "De Historia Stirpium" by Leonhart Fuchs (1542) is proving most timely in relation to the development of the National Herb Garden. Dr. Dudley's work on hollies in collaboration with G. K. Eisenbeiss continues to elucidate new taxonomic clarifications, this time in relation to confusion in the indigenous hollies of Eastern Europe. Mr. Jefferson initiated a project to establish a NA research collection of authenticated crabapple selections grown from cuttings. Mr. Mazzeo expanded and revised Trees of Shenandoah National Park first published in 1968.

Dr. Santamour has begun research on graft incompatibility in Acer, Quercus, and Ulmus with funding from the Horticultural Research Institute. The delayed problems created by scion/stock incompatibility in landscape and street plantings of improved cultivars are increasing and costly. Rootstock selection has become equally as important in ornamental trees as for fruit trees. Related to the problem of grafting is the study of initiation and cessation of cambial activity as measured through electrical resistance.

Dr. Egolf continues to develop new and improved cultivars with the release of 'Muskogee' and 'Natchez' hybrids of Lagerstroemia indica X L. fauriei with increased mildew resistance and improved flower color and habit. A major thrust in Syringa research is mildew free hybrids with compact growth and profuse flowering.

Dr. Ackerman continues his cold hardiness research on camellias, emphasizing Camellia oleifera crossed with C. s sanqua and C. hiemalis. A further goal is bridging the C. sasanqua - C. japonica gap through the use of fertile cultivars of C. vernalis. Major progress has been made with Lycoris (M. Williams) particularly in maintaining plantlet production through tissue culture. A new Lycoris from the People's Republic of China is Lycoris anhweiensis, unknown previously in Western literature.

For the first time, our horticultural, documentation, and educational programs have come under the CRIS system and have a reporting means whereby these programs can be made known to other institutions. Plant distribution programs as a result of the 1976 and 1978 explorations to Japan and releases of new NA cultivars have provided an exceptional range of new garden plants for evaluation in collaborating institutions and to expand our own collections. Exchange of plants is a fundamental responsibility for our institution and the quality of the exchange is dependent on exploration activities, research products, and documentation of materials offered. At no time, has both the quality and quantity of plants offered by the NA been as high as the present period.

We can summarize the status of individual collections by stating that every major garden in the Arboretum has been expanded, upgraded, or in some manner renovated. It is clear, however, that this important aspect of arboretum life can only be sustained with leadership, people, and funds. The National Herb Garden is, of course, the major developmental project for 1979. This project sponsored by The Herb Society of America culminates more than a decade of effort by that Society to bring a national herb garden into reality. There is no doubt but that without the determination of the members of HSA, this great development would not have succeeded.

The education programs at the National Arboretum attempt to reach a broad segment of the local and national audience. It has become obvious that our educational offerings on the basis of present staff and facilities do not meet the potential interest. We handled an unprecedented 27,200 public inquiries. Many were for the very popular Arboretum poster. The first edition of the poster (200,000) is about exhausted and a revision will be available in the spring of 1980.

The approval of the National Arboretum Master Plan by the National Capital Planning Commission was a major event in our development. This now places us squarely on the road to the development of the main entrance and the much needed educational center. It has been almost ten years since the beginning of the Master Plan, but the intervening time has not been wasted. The major shift of emphasis from "M" Street resulting from acquisition of the brickyard was undoubtedly a fortuitous step. Similarly, the passage of the National Arboretum Gift Act and its subsequent employment for the development of the National Herb Garden with the cooperation of The Herb Society of America demonstrates the approach that can be utilized in the implementation of the Master Plan.

ARBORETUM ADMINISTRATION

A. Organization

The Department of Agriculture effected an organizational change placing the Director, Science and Education Administration, directly under the Secretary of Agriculture. The line of authority is from Secretary Bergland through Dr. Anson R. Bertrand, Director, Science and Education Administration, through Mr. Talcott W. Edminster, Deputy Director, Agricultural Research, through Dr. Steven C. King, Regional Administrator for Agricultural Research, Northeastern Region, to Dr. John L. Creech, Director, U.S. National Arboretum.

B. Operating Budgets

The initial FY 1979 Operating Budgets at the U.S. National Arboretum for salaries and support services was $1,695,700. This was increased during the year by $359,963 to cover the inflated cost of energy, for additional supplies and materials, for emergency repair and maintenance problems, and for updating equipment.

The initial FY 1980 Operating Budgets was $1,764,300. Under a special repair and maintenance program, the U.S. National Arboretum received an initial $165,000 for repair and maintenance activities. These funds are earmarked for the second phase of a three phase program of renovating the roads, for replacement of one of the two boilers of the greenhouse heating system, and for updating the heating and air-conditioning system in the Administration Building. In addition, the U.S. National Arboretum received $78,269 to support the Young Adult Conservation Corps and the Youth Conservation Corps programs.

National Arboretum Gift Act - There are now eight separate accounts in this fund, mostly carryovers from the previous year. A contribution from the Horticultural Research Institute is the only new account under the Act. This provides funds for Dr. Santamour's research on graft incompatibility in woody landscape plants. The total in the Gift Act accounts is $54,970.

The Friends of the National Arboretum established by the National Arboretum Advisory Council continues to be a highly desirable support for purchase of rare plants, books, benches, bonsai containers and audio-visual equipment. The contributions received in 1979 amounted to $9,175.55, and expenditures amounted to $7,760.97. The balance at the end of December 1979, is $13,995.43. Trustees of the Friends of the National Arboretum are Dr. Frank P. Cullinan, Mrs. Elizabeth Rea, and Mr. Robert Lederer. Dr. Richard White serves as Auditor.

C. Developmental Activities

The National Capital Planning Commission approved the Master Plan for the U.S. National Arboretum on October 4, 1979. This is a major accomplishment in terms of our future development. Approval of Master Plans is required before any Federal Agency can undertake new projects. Our Master Plan process began in 1971 when the preliminary plans were submitted. While approval of our Master Plan is a most essential step in our future, it is just the beginning. Each of these steps leads us toward development of the brickyard.

The first phase of road renovation including the greenhouse area, Administration Building parking areas, and the roads to the azaleas and around the synoptic circle was completed. The second phase which will include a second one-third of the roads was funded in 1979 and sent out for bids. The two outdoor restrooms were refurbished and heaters installed.

A 40-foot flagpole with interior lanyard system and of handsome aluminum construction was placed in the front of the Administration Building by the Woman's National Farm and Garden Association, Inc., in memory of Helen McDonald Saunders, Past President of WNFGA. The excess funds have provided for much needed repairs to the fountain in the Dogwood Garden.

The National Herb Garden construction contract was started in the spring of 1979 with an expected completion date of October. Unfortunately, heavy and recurring rains throughout the summer caused extensive delays and construction continued through the year. The contractor is East Atlantic Construction Company, the minority contractor who built the Bonsai Pavilion.

Because of the construction delays, planting will occur in the spring of 1980. The dedication will take place on June 12, 1980. The development of the National Herb Garden is a complex operation involving close coordination among The Herb Society of America, the Architect (Mr. T. Wirth), the National Arboretum staff, and the contractor. In addition, the American Association of Nurserymen has assisted in locating much of the woody plant materials for the garden.

The Dorothy Jordan Chadwick Overlook in Cryptomeria Valley is fully planted and is now used by visitors. This remarkable vista site is landscaped with Japanese plants and serves as a demonstration garden for new combinations of Japanese species. Several years ago, the Valley was reclaimed and a stone water course with a series of small falls was established to correct earlier erosion. Unfortunately, the flow has been insufficient to serve our intentions. It appears that we will now need to provide for a recirculating system to create the desired effect.

A site for the bird-walk has been selected and a preliminary list of shrubs and bird-attracting plants prepared by Mr. Carl Buchheister. The bird-walk will be smaller than previously envisioned and is sited in the sector of the Arboretum adjacent to the old entrance road where the temporary offices were located. Several fine shrubs to attract birds already exist and the cost for the undertaking should be modest.

The plans for the shrub garden and a new handicapped trail remain in abeyance due to fund and personnel limitations.

D. Personnel Operations

The personnel strength of the U.S. National Arboretum for Calendar Year 1979 was 75 full-time employees and 6 part-time employees. Twelve (12) part-time students and 3 temporary summer aids were employed. In addition, there were 2 YCC Counselors, 15 YCC Enrollees, and 27 YACC Enrollees.

Training opportunities were provided for 65 employees ranging from orientation, safety, and pesticide applicators courses. The most intensive training was taken by Sherrill Sasser in Cartography Phase II at the Fort Belvoir Defense Mapping School.

Near the end of Calendar Year 1978, Gladys S. Richards transferred from the Chesapeake-Potomac Area to become the Director's Secretary. The Northeastern Region detailed Marion C. Carter from the Beltsville Agricultural Research Center at the beginning of the calendar year. Redescription of duties was effected for John L. Creech, Marion W. Scarborough, Sylvester G. March, and Erik A. Neumann. A reassignment was effected for Marion C. Carter. Recruitment actions were effected for Laura Gray, Georgia S. Barton, Delores Woods, Tolatha B. Roane, Susan Frost, and Teresa L. Ayers. Promotions were effected for Ernest J. Luskey, Margot Osborne, James McClammer, Anne O. Andrick, Robert T. Faltynski, Stephen Roberts, Barbara A. Carr, and Adelaide Grier. Our five employees hired from the Melwood Horticultural Training Center were converted to career appointments. We have actions pending to convert three of our Curators to Horticulturists. Also, we have actions pending to employ Horticulturists as Curator of the National Herb Garden and as a Plant Propagator in 1980.

The establishment of the position of Assistant to the Director required the acquisition of office furniture and equipment. We successfully obtained the necessary desks, bookcases, file cabinets, Mag Card typewriter, and Selectric typewriter to fully equip the office from surplus property, thereby avoiding the necessity of using our very limited financial resources to purchase these items.

Dr. Donald R. Egolf received the 1979 Norman J. Colman award from the American Association of Nurserymen. This is the highest award the industry can present to a researcher. Dr. Egolf has established a worldwide reputation for his breeding programs with Hibiscus, Lagerstroemia, Pyracantha, and Viburnum. These contributions to the nursery industry are recognized as exceptional additions to the quality of plants in gardens and a credit to Dr. Egolf and his unit and to the U.S. National Arboretum.

Dr. John L. Creech received the prestigious Arthur Hoyt Scott Garden and Horticulture Award from Swarthmore College, Swarthmore, Pennsylvania. The award is given as an acknowledgement of "achievement of great merit, a recognition of work in creating and developing a wider interest in gardening." Personally and professionally, Dr. Creech has devoted his life to improving horticulture in America, one of the objectives the Scott Medal seeks to support. He has guided the National Arboretum toward a prominent position in horticulture both nationally and internationally; and, through his plant explorations, has added many fine plants to American gardens. These efforts have certainly created a wider interest in horticulture and constitute a significant contribution to the science and art of gardening.

E. Facilities

The facilities continue to be upgraded on a priority basis with repair and maintenance funds from SEA.

SEA provided funds to rebuild the overlook in the lower azalea area. This overlook was constructed in 1949 as a part of the gift of The Netherlands in memory of Americans who helped the Dutch people during World War II. The overlook had deteriorated badly over the last several years and its repairs are in keeping with rehabilitation activities in the Valley.

The National Capital Area Federation of Garden Clubs continued improvements to the Information Center by providing a much needed direct entrance to the basement activities room.

A number of repair and maintenance projects were funded during FY 1980 (October 1979).

1. Phase 2 of road repairs.....	$100,000
2. New greenhouse boiler and repairs to heat system....	55,000
3. Servicing the Administration Building air-conditioning system.....	10,000
Carryover projects yet to be initiated include the re-roofing of the Administration Building and Herbarium..	35,000

Funds have also been requested for stabilization of the two brick kilns and one stack in the brickyard complex. This is a requirement of the National Capital Planning Commission.

New equipment includes several Cushman carts and a tractor-trencher with backfill blade ($8,000).

Security. 1979 was a mixed year from a security viewpoint. We continue to utilize a combination of 3 in-house guards for daytime security and a contract arrangement for the nonpublic hours between 5 P.M. and 6 A.M. As a consequence of this system plus the frequent patrolling by the Metropolitan Police, we kept the grounds fairly secure. Nevertheless, a rash of vandalism concentration on the Administration Building resulted in broken windows and doors in the lobby and herbarium and total destruction to a former residence by fire. As a result of the latter, the building had to be razed at a cost of $16,950. This reduced our storage space markedly and presented problems for YCC housing. As an alternative, we procured a 55-foot house trailer from the Beltsville Agricultural Research Center and this will be used as a YCC office and housing facility.

Safety. The program to upgrade the health and safety of employees and the public continues. A Safety Committee functions under the chairmanship of Mr. Craig Keys. Regular inspections identify hazards and other safety-related items. Projects such as road repairs, renovation of the guard-house, and refurbishing the outside restrooms are examples. Our attempts to provide CPR and First Aid Training were less-than-adequate, but plans are underway to try again. We have attempted to secure health monitoring services for our pesticide applicators. Although we have experienced many delays, we are still working toward achieving this goal.

F. U.S. National Arboretum - Weather 1979 (Anne Andrick)

Temperatures during 1979 ranged from a high of 94° F. to a low of 2°F. The latest freeze date in the spring was the night of April 6 (32°), while the earliest freeze date in the fall was the night of November 4 (31°). February proved to be extremely cold with daytime temperatures remaining below 32° for 13 of the first 24 days of the month, while the nighttime temperatures ranged from the mid- to the low teens 8 nights, and below 10° 9 nights, with the lowest temperature of the year, 2° on February 17 and 18. A warming trend developed toward the end of February; and March temperatures were well above normal, with a recordbreaking 84° on March 30. April and May were close to normal, while June and July were unusually cool, with daytime temperatures in June ranging from the high 70's to the mid-80's. Normally, the temperature would have reached 90° before July 1; however, in 1979, we did not reach 90° until July 12 and then only 3 times during the month of July. Our highest temperature of the year, 94°, was recorded on August 10. September and October were close to normal, although we reached a high of only 42° on October 10. In November, temperatures ranged in the 70's from the 18th through the 26th; and on December 12, we recorded a high of 70°.

Precipitation during 1979 was extremely heavy, totaling 58.25 inches as compared with the 10-year average (1969-1978) of 46.51 inches. In fact, according to the records maintained at the U.S. National Arboretum since 1946, on only one other occasion has this been exceeded and that was in 1948 when the Arboretum recorded 58.41 inches. The precipitation was fairly well distributed throughout the year, with only one month receiving less than 2½ inches--December precipitation totaled only 0.91 inches. Heaviest monthly precipitation occurred in September, 9.36 inches, which included 6.18 inches of rain as a result of Hurricane David and 2.66 inches as an offshoot of Hurricane Henri. Both January and February were well above our 10-year average. The 7.16 inches in January was mostly in the form of rain, and occurred on 17 of the 31 days. The only significant snowfall in January was 2 inches on the 28th. The 5.78 inches recorded in February occurred on 13 of the 28 days; and included 3 snowfalls of 6½ inches, 7 inches, and 17 inches. The 17-inch snowfall on February 18-19 was followed almost immediately by 3.36 inches of rain (February 23-26). In addition to the 58.25 inch total annual precipitation, another record breaking event occurred during 1979--the snow which fell from approximately 7 a.m. until noon on October 10, melting almost as soon as it fell. The only earlier snowfall ever recorded in the National Capital area occurred on October 5, 1892, and produced only a trace.

G. Plant Patents (Barbara A. Carr)

Seventeen new plant patents were processed for review during the year. These plant patents included a range of plant materials, mainly ornamentals: Ligustrum, Vitaceae, Acanthus, Acacia, Malus, Prunus, Cornus, Rhododendron, Spathiphyllum, Myoporum, Fraxinus, rhubarb, bromeliads, and grasses. At the end of 1979, there are 4,492 published plant patents on file. These completed patents are available for reference at the Arboretum. The processing and maintenance of the plant patents and file is handled within the Arboretum Herbarium by Barbara Carr. This complete plant patent file is the only one of its kind besides the one housed at the U.S. Patent Office.

PLANTS, PLANTINGS, AND HORTICULTURE

A. Plant Records, Mapping, Graphics, and Labeling (R. M. Jefferson)

From January 1979 through December 1979, the following accomplishments are noted:

--1,379 plants, seeds, scions and cuttings were accessioned.

--Approximately 9,100 new record, research and display labels were added to, or replaced, in various plant collections and research areas throughout the Arboretum.

--Sherrill Sasser spent several months in training at the Defense Mapping School, Fort Belvoir, Virginia. This training consisted of field and classroom studies in construction surveying, from April 11 to July 7 and construction drafting from August 23 through November 9. She spent the remainder of 1979 doing layouts for various signs and labels and some drafting of construction features on the grounds and in the building.

--Roland M. Jefferson was selected to serve as a board member on the Advisory Council for the American Horticultural Society Plant Science Data Center.

--In order to upgrade the Arboretum's label making capabilities, two new machines, the Multigraphics 6400 Graphotype and the Compugraphic Editwriter 7400 were added to the work unit.

The Multigraphic 6400 Graphotype is a keyboard operated machine that is used to emboss highly legible data on metal plant record labels. It is carriage operated with automatic quick-change line and letter spacing controls. Because of the efficiency of this machine, an ever increasing number of plant record labels, needed for a wide range of Arboretum plant accessions, can be quickly made.

The Compugraphic Editwriter 7400 performs typesetting functions in order to produce photographically lettered copy. It is keyboard operated with a screen that reflects copy and instructions entered from the keyboard. The screen, or video display terminal, has a memory capacity of 6,000 characters or 200 lines. Thirteen lines of this memory can be viewed on the screen at one time. Information within the screen memory can be rolled up or down, enabling the operator to view any section of copy on the screen, and when necessary, perform any editing functions. With various font changes, this machine can be set to produce copy from several hundred type-faces (letter styles) on photographic paper or clear film. By using film to record lettered copy, negatives, for printing photo-sensitized aluminum display labels and signs, can be made in minutes.

B. Plant Collections (S. G. March)

Azalea-Rhododendron Collection. The main theme this year has been cooperation, reclamation and expansion. With the assistance of additional manpower provided by the YACC Program, and cooperation among permanent crew members, the reclamation of additional neglected areas has been made possible. Among these is Azalea Valley on the lower side of Azalea Road. This area, which was previously overgrown with underbrush, honeysuckle, and wisteria, has been cleared and replanted in grass for easy maintenance. In addition, work is being completed on reconstruction of the brick wall at the Azalea Overlook, which had been weakened by weather conditions of the past two winters, and vandalism. With the help of a donation made by Dr. James K. DeVore, new plantings will be made around the Overlook Area and in the Azalea Valley to enhance the vista into the Valley from the Overlook. This will again provide the beautiful vista originally intended when it was donated by the people of The Netherlands in 1949. Our last priority in 1979 was the start of expansion of the Rhododendron Collection in the Gotelli Rhododendron Area. This was comprised mainly of removing a number of tulip poplar trees to increase light in the area. In the future, this area will be reworked and planted with suitable species and cultivars of Rhododendron. Our first goal is to assemble a limited collection of the best cultivars of the Dexter Rhododendrons. The Dexters, with their Rhododendron fortunei parentage, have proven successful in this area. Contact has been made with rhododendron specialists who are supportive of this project for plant material. In retrospect, through the efforts of Curator Ronald L. Bare and his crew, 1979 has been a year of progress, another step on the ladder to increasing our prestige among institutions with noteworthy azalea and rhododendron collections.

Bonsai Collection. The National Bonsai Collection continues to be in good health under the curatorship of Robert F. Drechsler. This collection affords the people of the Washington area and visitors from around the world an opportunity to view an outstanding collection of mature master bonsai. The Curator has made an effort to start some new bonsai from material available from the Arboretum's research and plant distribution programs. Our collection of Satsuki azaleas and chrysanthemum bonsai continues to grow in numbers, and give a good show during their respective flowering periods. Plants of pine species used in bonsai are being raised to begin a series of experiments with soil mixtures, fertilizer and training procedures. Requests for talks on bonsai continue to be received for presentation to a wide range of audiences. Among those given this past year was a series for the Smithsonian Associates, Pennsylvania Bonsai Society, Prince Georges County Library Lecture Series and at the National Bonsai Convention. A course in basic bonsai, conducted by Mr. Drechsler, was given in the spring. In April, we were visited by several members of the Nippon Bonsai Association who had donated bonsai to The National Collection. This was their last official visit to their children (bonsai). Among other notable visitors during the year were Princess Chichibu, sister of Emperor Hirohito, Mrs. Rosalynn Carter and Mrs. Shigeko Ohira, wife of the Japanese Prime Minister. Public visitors to the collection continue to number approximately 60,000 annually. The outstanding appearance of the Japanese Garden and Bonsai Pavilion is due to a large degree to the efforts of Miss Margot Osborne, assistant to the curator. Her

continued interest in and dedication to the Arboretum has been exemplary. Mrs. Ruth Lamanna and Mrs. Janet Lanman continue to volunteer their invaluable services assisting on a regular basis with the potting and training of the bonsai.

Boxwood, Daylily, Peony, Iris and Hibiscus Collections; Activities Center. The Daylily Collection has been put on the American Hemerocallis Society Display Garden List. Only those gardens open to the public and growing noteworthy daylilies that are well maintained are eligible for this honor. Mr. Henry Mitchell, a writer for The Washington Post, wrote several articles which mention the garden favorably. With reference to the Daylily Collection, one article comments, "As one of the garden's most conspicuous (and some said intemperate) critics a few years ago, I am grateful that it is now about as beautiful as a garden can be." Mr. Lynn R. Batdorf, Curator for this garden, can be proud of this recognition.

The plantings around the Activities Building and the herbaceous Hibiscus planting have been added to Mr. Batdorf's area of responsibility. Revitalization of the plantings and additional planting around the Activities Building has begun, with more to be done. All the plants in the Hibiscus planting have been divided.

Camellia and Garden Club of America Plantings. The Camellia planting is still suffering as a result of the severity of the winters of 1977, 1978, and March of 1979. Curator E. Joseph Luskey and his crew have been trying valiantly to rejuvenate the damaged plants. Despite the fact that we had more than normally adequate rainfall in 1979, plus extra watering, fertilizing, and mulching of the camellia plantings, we are still losing plants due to the two previous winters. Many camellias have been replanted, as well as other select plants native to Japan. One revelation of the past severe winters is the apparent cold hardiness in this area of Camellia oleifera, a species from China. Our specimen plant grown from seed received from the Lu Shan Botanical Garden, Kuling, China, in 1948, survived unscathed. Test plantings of hybrids using C. oleifera made by Dr. William Ackerman look promising.

A planting of native collected and cultivated herbaceous material resulting from the 1978 U.S. National Arboretum - National Geographic Society plant exploration to Western Japan has been made in the Cryptomeria forest. The planting includes such genera as Adonis, Anemone, Epimedium, Hosta, Ligularia, Liriope, and Ophiopogon.

With the addition of two specimen Acer palmatum and one hundred Satsuki Azalea 'Gumpo' plants, the Dorothy Jordan Chadwick memorial walk has been completed. The Arboretum has received several favorable comments on this delightful area. This planting, and the preliminary planting of the Camellia Valley, has been made possible by generous donations from Mrs. Randolph Kidder. The Valley area has the potential of becoming the major attraction at the Arboretum as was envisioned by B. Y. Morrison in 1952.

One of the plants of special interest at the lower Chadwick Overlook is Aucuba japonica var. borealis, a low compact variety collected by Dr. John L. Creech in Hokkaido, Japan, in 1961.

Fern Valley; Daffodil - Ivy Plantings. A collection of nineteen fern species and four wildflower species purchased from a commercial source has been added to Fern Valley. These were planted near the trail and along the roadway for easy visitor observation. The fern acquisitions are the first installment in assembling all the native Eastern U.S. species suitable for culture in Washington. Fern species not available as plants will be grown from spores obtained through the spore exchange program of the American Fern Society. Native orchids and other wildflowers growing in local threatened habitat areas were collected by Gardener-in-Charge Craig Keys, and transplanted to Fern Valley.

The memory of Mrs. Lillian Meyers, a daffodil enthusiast and volunteer worker in Fern Valley, was honored by the donation of a teakwood bench, daffodils and native plant material from her family and friends, for the Daffodil - Ivy plantings. Daffodils planted included favorites of Mrs. Meyers. Eighteen additional daffodil cultivars have been added to the collection with funds provided by the Washington Daffodil Society, and through donations. Many of these are favorites as polled by members of the American Daffodil Society.

The Youth Conservation Corps worked in Fern Valley for the fourth consecutive year, with Mr. Craig Keys providing technical support. As in the past, the major emphasis was on the development and maintenance of existing plantings and structures. Corps members continued to add the stone and post borders as barriers along pathways to protect plantings of wildflowers and ferns from being trampled. These borders have proven effective in protecting fragile plant material while not detracting from the natural woodland setting. Additional stone was placed along the Fern Valley stream bank to prevent erosion. The stream had its annual clearing of debris, as did the drainage swale on the upper side of the valley. Corps members planted rhododendron, mountain laurel and hemlock in Fern Valley and in the Ivy - Daffodil plantings. Potential carpenters in the Corps had the opportunity to demonstrate their skills by placing new shingles on the tool shed, and repairing bridges. Less enthusiastically approached tasks, such as honeysuckle and jewelweed eradication, were also accomplished.

Gotelli Conifer Collection. The Donald P. and Hazel Smith Pine Collection was moved to the Arboretum and planted in March and April on a gently sloping hillside adjacent to the Gotelli Collection. The collection, donated last year by the Smiths, comprises fifty-nine plants representing eighteen species and numerous cultivars. With the help of abundant rainfall this summer, the plants have settled in well. The Smiths visited the Arboretum in November 1979, and were delighted with the collection in its new setting. During their visit, Dr. Creech presented the Smiths with a certificate of appreciation from Dr. Steven C. King for their gift.

Under the enthusiastic direction of new Curator Susan R. Frost, the much needed renovation of the Gotelli Collection has begun. Dwarf conifers do grow and become sizable with the passage of time. It is now necessary to make adjustments in the collection and eliminate crowding by moving plants to new locations. Some of the bed areas have been regraded for better drainage. The pond has been reconstructed, and the junipers previously planted around it were removed and replaced with grass, creating a more subtle enhancement of the vista to the plantings behind the pond. Two specimen plants of Picea abies 'Maxwelli' have been moved in from a crowded location and placed behind the pond to help frame the vista.

Related projects under way include the remapping and relabeling of the collection. Additional plants of Hamamelis and Cotinus cultivars were added to their respective plantings.

Holly - Magnolia Collection. The continuing reduction in permanent grounds staff has curtailed the level of maintenance of several plant collections, one of these being the Holly - Magnolia Collection. In September, we were fortunate in being able to hire Mr. Thomas M. Monroe, a senior in Horticulture at the University of Maryland, on a 1040 student appointment. Mr. Monroe, with supportive help from a YACC enrollee and occasional help from Mr. Ronald Bare and his crew, has made outstanding progress in improving the level of maintenance and appearance in this area. Initial efforts have been in weed and vine eradication around the plants, followed by mulching and the application of preemergence herbicides where appropriate. Late in the year, pruning of the collection began. In general, most specimens are being cleared of dead wood, and shaped with respect to their natural growth habit. Scheduled for spring of 1980 is the planting out of material at the greenhouse, including Magnolia species and ten of the best cultivars of Ilex opaca.

C. Plant and Seed Distribution Programs, 1979

Domestic Plant Distribution

Number of participating arboreta, botanic gardens and research institutions	247
Number of institutions requesting plants	183
Number of items available for distribution	34
Number of plants sent	6,175

Commercial Plant Distribution

Number of participating nurserymen	51
Number of nurseries requesting plants	34
Number of items available for distribution	6
Number of plants sent	665

Formal Overseas Seed Exchange - Index Seminum

Number of arboreta, botanic gardens and research institutions participating	295
Number of institutions requesting seed	153
Number of items available	225
Number of seed packets sent	3,972

Special Domestic Distribution - Japanese Collections - 1978 USDA-National Geographic Society Plant Exploration to Western Japan

Number of participating arboreta, botanic gardens and research institutions	16
Number of institutions requesting plants	12
Number of items available for distribution	28
Number of plants sent	158

Special Worldwide Distribution - Rhododendron kiusianum Cultivars

Number of participating arboreta, botanic gardens, research institutions, nurseries and plant specialists	23
Number of institutions requesting plants	20
Number of cultivars available for distribution	16
Number of plants sent	237

Special Worldwide Distribution - NA Introductions Pyracantha X 'Navaho' and X 'Teton'

Number of participating arboreta, botanic gardens and research institutions	345
Number of institutions requesting plants	105
Number of plants of 'Navaho' sent	105
Number of plants of 'Teton' sent	105
Number of institutions requesting cuttings	6
Number of cuttings of 'Navaho' sent	25
Number of cuttings of 'Teton' sent	25

Special Worldwide Distribution - NA Introduction
Cephalotaxus harringtonia var. drupacea 'Duke Gardens'

Number of participating arboreta, botanic gardens and research institutions	345
Number of institutions requesting plants	106
Number of plants sent	106
Number of institutions requesting cuttings	9
Number of cuttings sent	60

Special Worldwide Distribution - NA Introduction
Lagerstroemia indica 'Cherokee'

Number of participating arboreta, botanic gardens and research institutions	345
Number of institutions requesting plants	110
Number of plants sent	75
Number of requests awaiting shipment	35
Number of institutions requesting cuttings	3
Number of cuttings sent	30

Special Requests - Worldwide for Plant Material from NA Collections

Number of requests for plants	94
Number of plants sent	1,964
Number of requests for seed	18
Number of seed packets sent	141
Number of requests for cuttings/scions/divisions	39
Number of cuttings/scions/divisions sent	3,364

Selected examples of the above listed requests include: Plants of 9 Buxus microphylla var. japonica collections made in Japan to Mr. Tom Ewert, The Orland E. White Arboretum, Boyce, Virginia, for evaluation as part of their research program with boxwood; plants of 17 Aucuba japonica selections from Japan to Mr. Tom Dodd, Jr., Tom Dodd Nurseries, Semmes, Alabama, for evaluation and possible introduction into the nursery trade; plants of 14 unusual species and cultivars of ornamentals for the 150th Anniversary Celebration of the Massachusetts Horticultural Society, Boston, Massachusetts; plants of 4 Rhododendron species from native collections made in Japan to Dr. J. Heursel, Ornamental Plant Station, Melle, Belgium, for use in a plant breeding program; seed of 9 native woody plant collections to Dr. Earl W. Belcher, Jr., U.S. Forest Service, Tree Seed Center, Macon, Georgia, for dissemination to their clients; scions of 10 Magnolia species and cultivars to Mr. Takashi Nakamura, Hongo, Okabemachi, Oosatogun, Saitama, Japan, for introduction into Japanese nursery trade; plants of 5 American Rhododendron species to Mr. Simon Bowes Lyon, St. Pauls Walden Bury, Hitchin, Herts, England, for adding to his study collection of American Rhododendron species; plants of 6 Japanese cultivars of Wisteria floribunda to Mr. Don Shadow, Shadow Nursery, Inc., Winchester, Tennessee, for possible introduction into nursery trade; cuttings of 16 species and cultivars of Hedera to Mr. W. O. Freeland, The Garden Spot, Columbia, South Carolina, for propagating and

offering to the public; seed of 52 species of native collected North American plants to Mr. Ichiro Sakanashi, Higashiyama Botanical Gardens, Nagoya, Japan, to be used in the establishment of a garden of American plants; plants of Microbiota decussata introduced into the United States from Russia by Dr. John L. Creech to Mr. J.R.P. van Hoey Smith, Arboretum Trompenburg, Rotterdam, Netherlands, for comparison with plants Mr. van Hoey Smith introduced into The Netherlands from Russia.

Total Number of Plants/Cuttings/Scions/Divisions/ Seed Packets Shipped

Plants	9,590
Cuttings/scions/divisions	3,504
Seed Packets	4,113
Total Number of Shipments	892

D. Plant Acquisitions (some significant donations/purchases)

Plants of 6 Acer palmatum cultivars from Mr. J. D. Vertrees, Maplewood Nursery, Roseburg, Oregon; plants of 5 Hemerocallis cultivars from Mr. Frank De Cona, Silver Spring, Maryland; an 18-foot specimen plant of Picea abies 'Pendula' from Mr. William J. Morgan, Bowie, Maryland; seed of 16 native collections of American species of azalea and rhododendron from Dr. Norman E. Pellett, University of Vermont, Burlington, Vermont; plants of 5 cultivars of the "PJM" Rhododendron hybrids from Mr. Edward Mezitt, Weston Nursery, Hopkinton, Massachusetts; cuttings of the true Origanum onites, collected in the wild in Greece, from Mrs. Carl W. Buchheister, Bethesda, Maryland; plants of 43 bearded Iris cultivars from Mrs. Charles M. Cox, Falls Church, Virginia; plants of 7 fern species from Mr. Francis M. Sinclair, Exeter, New Hampshire; bulbs of 11 Narcissus cultivars from Mr. Grant E. Mitsch, Novelty Daffodils, Hubbard, Oregon; bulbs of 7 Narcissus cultivars from Mr. Brent Heath, The Daffodil Mart, Gloucester, Virginia; plants of 59 rare and unusual Pinus species and cultivars from Mr. and Mrs. Donald P. Smith, Watnong Nursery, Morris Plains, New Jersey; seed of 25 plant species native to China from the excellent contacts developing with the (1) Chiangsu Institute of Botany, Nanking, (2) Institute of Botany, Academia Sinica, Peking, (3) Chekiang Forestry College, Hangchow, Chekiang and (4) Forestry Research Institute of Kwangtung Province, Saho, Canton.

E. Special Items

Nagoya Flower Show

The U.S. National Arboretum, in cooperation with Colonial Williamsburg, Williamsburg, Virginia, participated in the Third Annual Nagoya Flower Show, Nagoya, Japan, in April 1979. This show, sponsored by the Chunichi Newspaper, Nagoya Botanical Garden, and the Chunichi Horticultural Society, with assistance from Japan Airlines, is attended by over 150,000 people. Cut specimens of 25 broadleaved evergreens, representing a broad array of species native to Eastern United States, were sent.

Greenhouse

To help alleviate the shortage of greenhouse/overwintering facilities available to the Horticulture Unit, Dr. Howard Waterworth offered the use of a vacant screen house at the Glenn Dale Station. Under the direction of Greenhouse Foreman Loring I. Benedict, and with the help of the Glenn Dale staff, this 32' x 100' x 12' structure was converted into an igloo for overwintering containered and balled and burlapped nursery stock destined for planting in the Garden Club of America planting and the National Herb Garden. The basic structure was repaired by replacing rotted 2 x 4's, and painting. The frame was first covered with 2-inch chicken wire mesh, then covered with 1/4-inch microfoam insulation, which in turn was covered with 6 mil plastic. Electric theremostats control kerosene heaters to maintain a temperature just above freezing. Despite frustrations in getting the microfoam and plastic tacked down (suggest a very calm day), we are maintaining a frost-free condition in the igloo, with a minimum consumption of fuel and a minimum of effort in maintaining the plant material.

YACC

The Young Adult Conservation Corps (YACC) was established by Congress, Public Law 95-93, in August 1977. The Corps is administered by the Department of Labor through the Departments of Agriculture and Interior. The objectives of the program are to give meaningful employment in Federal, state and local governments to unemployed young adults between the ages of 16 through 23, regardless of social, economic and racial classifications and to accomplish needed conservation work on public lands. Enrollees may stay in the program for up to one year and are paid the minimum wage. Funding for enrollee salaries and support material is provided by a special appropriation to the Arboretum. In the spring of 1978, the Arboretum was invited to participate in the Northeastern Region, SEA, YACC program along with the Beltsville Agricultural Research Center and Plum Island Animal Disease Center. The nonresidential camp at the Arboretum started on June 12, 1978, with enrollees assigned to a broad array of units at the Arboretum including the Director's Office, the Education Office, Library, Greenhouse, Herbarium, Plant Records, Shade Tree Breeding Project, Shrub Breeding Project, and with the various plant collection curators and shops maintenance departments.

Enrollees learn from and help the regular employees with the ongoing assignments. Each enrollee is provided with a brief job description to help him understand how he fits into the work force. The enrollees are evaluated at three intervals during their stay for such things as acceptance of responsibility, quantity and quality of work and attendance. The strengths, weaknesses and future potential of the enrollee are discussed with his supervisor.

The on-board strength varies from 22 to 30 depending on the seasonal needs of the Arboretum departments. Enrollees are recruited from the local unemployment offices. During an enrollee's tour of duty, he is encouraged to find permanent employment. In the past year, 55 enrollees were hired; 36 (70%) left for permanent employment and 15 (30%) left for medical or disciplinary reasons. Hiring, orientation and training to maintain the allotted man-hours is a continuous process. Enrollees working on the grounds are supplied with a uniform and safety equipment.

Mr. Lynn R. Batdorf, Assistant YACC Camp Director, participated in a YACC Workshop held in Milwaukee in November. Program policies and procedures were the main subjects. There were many opportunities to exchange ideas, successes and failures with other YACC Camps.

The YACC Program has matured over the last year and a half, and has proven to benefit the U.S. National Arboretum by providing much needed manpower to our administrative, research, education, horticulture, and facilities maintenance programs.

Mr. Sylvester G. March serves as the YACC Camp Director.

YCC

The YCC/U.S. National Arboretum relationship continues to be mutually beneficial, by the enrollees having the opportunity to participate in a variety of environmentally oriented work projects, and the Arboretum benefiting from the projects completed and having the experience of working with the youth who will utimately be responsible for maintaining and managing our natural resources.

The purpose of the federally-funded Youth Conservation Corps (YCC) Program is to further the development and maintenance of the natural resources of the United States by employing young men and women to work on conservation projects in the healthful outdoor atmosphere of the National Park System, the National Forest System, and other public land and water areas of the nation.

The objectives of the program are to provide gainful employment of America's youth, ages 15 through 18, during the summer months in a healthful outdoor atmosphere, an opportunity for an understanding and appreciation of the nation's natural environment and heritage and to further the development and maintenance of the natural resources of the United States by the youth who will ultimately be responsible for maintaining and managing these resources for the American people.

1979 marked the fourth year of our participation in the YCC Program. Our camp numbered 15 boys and girls from the District of Columbia residing near the Arboretum. Miss Judith Barger served as Camp Director, Mrs. Stella Koch as Assistant Camp Director. Both are science teachers in local schools. The enrollees were divided into two rotating work teams, one led by Miss Barger, the other by Mrs. Koch. One rotating team worked in Fern Valley for the eight-week term of the program; the other team rotated among various units on the grounds. Among the accomplishments, in addition to those mentioned in the Fern Valley Report, were the clearing of weed trees, underbrush, and vines blocking the vista from the Dogwood Rain Shelter to the Anacostia River, and the removal of weeds and debris in the Camellia Valley and the Dutch Azalea Valley. Not all is sweat and weed pulling. As part of the program's environmental awareness and cultural enrichment objectives, the enrollees went on several field excursions, including a trip on the Potomac River aboard a tugboat operated by the Department of the Interior for studying pollution

of the river; a visit to the gardens at Dumbarton Oaks; a visit to the Insect Collection at the Museum of Natural History, and an overnight spike camp trip to Assateague Island National Seashore Park.

Mr. Sylvester G. March serves as overall YCC Camp Coordinator.

EDUCATION, PUBLIC SERVICES AND LIBRARY

A. Education and Information

Response to Public Queries. The Education Office answered 27,200 requests for information including questions about plant problems, arboretum classes, horticultural events, and Arboretum collections. Because of the volume of inquiries, many plant information questions are now being referred to the Botanical Gardens, USDA specialists, and the area extension services where they have more adequate staff. Telephone calls accounted for approximately 4,800 inquiries and the remainder were divided between personal contact with Arboretum visitors and written correspondence. Requests for the National Arboretum poster are responsible for the great increase in the number of written inquiries. A write-up on the poster was included in three national magazines.

Volunteer Guide Service. Volunteer guides conducted 87 tours of the National Arboretum during the past year. Twenty-three volunteer guides and 7 student guides serve under a cooperative agreement between the Arboretum and the National Capital Area Federation of Garden Clubs with Mrs. Judy French representing the Federation as Volunteer Guide Chairman.

Intensive guide training classes were scheduled through the Arboretum Education Department. These classes and tours of Arboretum collections are conducted by Arboretum staff members and plant society specialists.

Tour scheduling is handled by Mrs. Mary Ann Jarvis of the Arboretum Education Department.

School groups and garden clubs accounted for nearly one-half of the above tours with the balance consisting of senior citizens, junior garden clubs, county extension tours, diplomatic wives, garden editors, college groups, miscellaneous professional groups, and others.

In addition to the tours handled by the volunteer guide service, 61 tours were conducted by members of the Arboretum staff.

Of particular note are tours given to the following groups:

--State University of New York, Agricultural and Technical College, Agronomy Club.
--Morris Arboretum - Staff and Associates.
--Longwood Gardens - Students, Professional Gardener Training Program.
--Longwood Gardens - Summer and International Students.
--Longwood Fellows, Longwood Gardens.
--Strybing Arboretum Society of Golden Gate Park, San Francisco.
--Asian American Forum.
--Connecticut Horticultural Society.
--Deutch Dendrologische Gesellschaft (German Dendrology Society).
--Garden Writers of America - Eastern Regional Meeting and Tour.
--Mrs. Cyrus Vance, wife of the Secretary of State, the wives of the Chiefs of Missions in Washington, along with the wives of the State Department and Congressional and Government Officials.
--National Dahlia Society.
--Smithsonian Associates.

Botanical Art Displays. Art displays are scheduled on a 6-8 week format, thus saving staff time in scheduling, hanging, packaging, and shipping of the exhibits. The necessity of installing many of the exhibits on weekends for the convenience of the artist continues to be a problem. Fifteen exhibits of a botanical or horticultural nature representing a variety of media and subject matter were exhibited on the lobby walls and in a museum case in the Administration Building during the past year.

Johnson Azalea Paintings. The Lucia Porcher Johnson Collection of azalea paintings was sent on loan to the following locations for exhibit:

--Calloway Gardens, Pine Mountain, Georgia.
--Portland Chapter of the American Rhododendron Society, for display at the North Willamette Experiment Station.

Arboretum Exhibits. The National Arboretum has provided the following special exhibits for display at various shows or functions:

Attracting Birds to the Garden. An exhibit, featuring trees and shrubs which may be planted by the homeowner to attract birds, was installed in the 1979 Flower Show, Rainbow in Spring 1979, cosponsored by the Takoma Park Horticultural Club and Takoma Park Azalea Committee. The show was held in the Takoma Park Municipal Building, Takoma Park, Maryland.

The Flower Show. National Guard Armory, Washington, D.C. The National Arboretum in cooperation with members of The Herb Society of America, received the "Best Exhibit Award" for its exhibit featuring an extensive herb garden.

U.S. Department of Agriculture. Cooperated with USDA exhibits staff in developing an exhibit on the National Arboretum for display in the Department of Agriculture, Administration Building. Photographs used in the exhibit were taken and provided by the Arboretum Education Office. The text was also prepared in cooperation with the Education Office.

Greening of Rockshire. The Education Office provided a photographic exhibit on the National Arboretum for the Greening of Rockshire Flower Show held at the Rockshire Village Center, Maryland.

Owen Brown Village Center. Provided a photographic exhibit on the National Arboretum at the Owen Brown Village Center, Columbia, Maryland.

Annual Outdoor Art Fair. Provided an exhibit on the National Arboretum for the Annual Outdoor Art Fair held in the President's Park, Washington, D.C. This event is sponsored by the U.S. Department of Interior and the Government of the District of Columbia, Department of Recreation.

Popular Publications. Nine Program Aids (PA) and USDA Home and Garden Bulletins (HG) were written, revised, and received new artwork during 1979. These publications are given a more contemporary feeling with new artwork as revisions and reprinting are done. Of particular note are HG-71 "Growing Azaleas and Rhododendrons" which has been rewritten and given new artwork, and PA 309, "The United States National Arboretum" has been completely redone,

with full color now approved by USDA following a written request and justification by the Education Office. Color slides taken by the Education Office were provided by this office for the publication.

Two hundred thousand copies of the full color poster, Agriculture Information Poster No. 1 were printed and distributed to plant societies, libraries, members of the Arboretum's mailing list, extension service offices, and other interested individuals and organizations. Copies of the poster were given out at each of the flower shows in which the Arboretum provided an exhibit. The supply of posters is almost exhausted.

The poster has been revised to provide new information on the National Herb Garden along with other minor changes. The new edition of the poster should be available in the spring of 1980.

The text of a Program Aid on the National Herb Garden has been written and submitted to USDA Popular Publications along with suggestions for artwork and the request for the design of a logo. The logo is to be used on this publication and on other publications related to the National Herb Garden.

Following approval by the Publications Committee, work has begun on the text of a USDA Home and Garden Bulletin on Growing Herbs. This work is being written in cooperation with Dr. James Duke, USDA, Science and Education Administration, Beltsville, Maryland.

The preliminary text is near completion on a USDA Home and Garden Bulletin, "Evergreens for Home Landscaping."

This publication is being written at the request of the Publications Branch in response to a large number of inquiries on the subject.

Correspondence Aids. Eighteen correspondence aids on various horticultural topics were prepared or revised for public distribution. Preparation of correspondence aids on herb sources and lists of plants for various specialty herb gardens is now in progress by Mary Ann Jarvis.

Radio-TV Talks and Workshops. Mr. Erik Neumann, Curator of Education, presented 14 programs for local and national radio and television. These included presentations on WGTS, the Broadcast Service of Columbia Union College, American University's WAMU-FM, and USDA programs, "A Better Way" and "Consumer Time." Shows taped for USDA's programs are broadcast to over 80 television stations, 520 radio stations nationwide. He appeared on "Evening Magazine," WRZ-TV, Boston, presenting a segment on the National Arboretum.

Of special interest was a half-hour appearance on "And How Does Your Garden Grow" which is broadcast by station WEAR, The Washington Ear, Inc., a radio reading service for the blind and physically handicapped which uses the broadcast facilities of the WETA-TV station. Also of note is the taping of a one-half hour television program on plant propagation. Three school children were included in this segment on making a "Windowsill Greenhouse."

The program included informal demonstration and discussion with the children. This program is to be used for television broadcast on educational television and for use in Fairfax County Public Schools. Four additional programs are scheduled for 1980, beginning with an hour program on landscaping with flowering trees and shrubs.

Forty-two talks or workshops were presented to groups varying from garden clubs, visiting Arboretum groups, high school and college classes, to educational specialists and press groups. Of special note are:

--A program given at the Beltsville Open House for Florists and Nurserymen.
--A program presented to the Hobby Greenhouse Association.
--Participation in the "Seminars and Demonstrations" given at the 1979 Flower Show held at the D.C. Armory, Washington, D.C.
--Presentation of a workshop at the National Aquatic Gardens.
--Participation as a lecturer for the Smithsonian Institution's seminar, Horticulture: A Practical Approach to 18th - 20th Century Gardening.

Special Projects. Mr. Neumann is involved in several Metropolitan Washington projects including the following:

USDA Graduate School Committee on Field Studies and Horticulture - Serves on this committee as coordinator of the National Arboretum Horticulture Series. Responsibilities include selection of instructors, course content, and promotion of the program. Regularly attends USDA Graduate School Teacher/Learning Effectiveness Workshops held for Graduate School faculty and staff.

The following classes are now held on a regular basis at the Arboretum in the National Arboretum Horticulture Series and in the Natural History Field Studies Program in cooperation with the Audubon Naturalist Society:

--Basic Methods of Plant Propagation
--Indoor Light Gardening
--Plants in the Home
--Introduction to Bonsai
--Herbs
--Vegetable Gardening
--The Home Greenhouse
--Annuals, Perennials, Bulbs, and Roses
--Ornamental Woody Landscape Plants I, II, III
--The Care and Maintenance of Outdoor Plants
--Nature Photography
--Woody Plant Identification
--Spring-Flowering Identification
--Nonflowering Plants
--Ferns and Fern Allies

The Adult Education classes are taught in a 3- to 10- session format, making use of classroom and greenhouse facilities at the Arboretum. Instructors include Arboretum staff members as well as specialists from local plant societies and the Extension Service.

National Arboretum Horticulture Classes. Three classes in bonsai given by Mr. Robert Drechsler, Curator of the National Bonsai Collection, and two classes on landscape plant materials taught by Erik Neumann, Curator of Education, were offered this year to members on the National Arboretum mailing list. All classes were overwhelmingly received by the public. More requests for participation in the classes were received than could be accommodated.

Arboretum Classes for Children. In order to satisfy many requests for programs designed for children, a short course, Plant Identification for Children was given by Erik Neumann, Curator of Education. A second class for children, Plant Propagation for Children, was offered in the summer of 1979.

Federation Horticulture School. Mr. Neumann served as an Advisor for the National Capital Area Federation of Garden Clubs, Inc., Horticulture School. Mrs. Jarvis, Program Assistant, again served as staging coordinator for the Horticulture School.

--Served as a consultant to the Chestertown, Maryland, Garden Club on their civic project "Selecting Landscape Plants for the City Park of Chestertown."

--Served as a consultant for Westchester apartments, Washington, D.C., in the selection of landscape plants.

Chevy Chase Citizens Association. Repeated for the second time a lecture, workshop on landscape trees and shrubs to the Chevy Chase Citizens Association.

Public School. Programs or teaching workshops were presented at the following public schools in the Washington area:

Thomas Jefferson School and Community Center
Arlington County Schools
Mark Twain High School (For behavioral problem students)
Rockville, Maryland
James Monroe High School

Gifted Science Project of Montgomery County. Participated in the Gifted Science Project which is a federally-funded program under the Elementary Secondary Education Act, Title IV-C, for the identification of resources for individual gifted science students and their teachers. The resources will be matched with objectives and topics in the Montgomery County Public Schools. They will include information on scientists, specific agencies and laboratories, print and nonprint materials, and special activities such as science awards, competitions, and science fairs.

The resource bank will provide the individual gifted science student an opportunity for indepth exploration within areas of his/her interest, or aptitude. As a result, existing science resources will be coordinated and made readily available to our individual gifted students and teachers. The project is planned for three years of funding; at the conclusion of the third year of the project, 1979-80, the material will be made available countrywide. Sample project materials will be prepared for dissemination to interested persons outside Montgomery County Schools. The project is publicized statewide and nationally.

Meetings and Events. Regularly scheduled horticultural and botanical organization meetings held in the Arboretum auditorium:

The Botanical Society of Washington, National Capital Orchid Society, Indoor Light Gardening Society, Gloxinia and Gesneriad Society, Begonia Society, Washington Bonsai Club, and Orchid Judging Center meet on a monthly basis; Camellia Society of the Potomac Valley, Potomac Valley Chapter of the American Rhododendron Society, and Brookside Bonsai Club meet bimonthly; Washington Daffodil Society, Washington Daylily Club, and Potomac Lily Society meet quarterly; and the Potomac Valley Chapter of the American Rock Garden Society meets annually. The National Capital Area Federation of Garden Clubs, Inc., holds bimonthly meetings at the Arboretum, as well as various committee meetings throughout the year, including a Horticulture School and Landscape Critics Council.

Other special meetings and events held at the Arboretum:

Zone VI Meeting of Garden Club of America.
Two hundred and fifty members of the American Phytopathological Society visited the Arboretum and were served a dinner buffet by the National Capital Federation of Garden Clubs, Inc.
An official reception was held for the wife of Japanese Prime Minister Ohira in the Arboretum Administration Building.

Flower Shows. The following plant societies held flower shows in the auditorium of the Administration Building: Indoor Light Gardening Society, Potomac Valley Camellia Society (fall show), Washington Daffodil Society, Potomac Bonsai Association, National Capital Daylily Club, National Capital Iris Club, and the National Capital Orchid Society, Potomac Valley Rhododendron Society, Potomac Lily Society. The Gloxinia and Gesneriad Society, and the National Capital Cactus and Succulent Society held flower shows at the Arboretum for the first time this year. These flower shows play an important role in the Arboretum's educational program, and their attendance is overwhelming

Flower Show and Use of Arboretum Facilities Guidelines. New guidelines for plant societies holding flower shows and organizations holding meetings at the Arboretum have been drawn up by Mary Ann Jarvis, Program Assistant. This enables us to exercise stricter control of the use of our facilities.

Tours, Horticultural Demonstrations, Films, and Nature Walks. In order to keep the public informed of events at the Arboretum, the Education Office issues an events newsletter listing nature walks, tours, horticultural and botanical films, special exhibits, horticulture demonstrations, and lectures held at the Arboretum. A separate listing of flower shows and art exhibits is now mailed to over 7,100 individuals who have requested notice of National Arboretum activities. These publications have been sent on a regular basis to the Washington Convention and Visitors Bureau, local newspapers, and radio and television stations for listing and for publicity purposes.

In compliance with Federal Regulations, a return postcard was sent to individuals on the Arboretum mailing list which must be returned in order to remain on our list. This should help remove individuals who do not wish to continue receiving announcements of Arboretum events.

Thirty-seven specialized tours, horticultural demonstrations, films, and nature walks were held during 1979 for the general public.

Six press releases were written and sent to the local media concerning publicity for Arboretum classes, flower shows, nature walks, special programs, and other events of interest to the public.

A Sunday afternoon lecture series featuring outstanding speakers in their fields was initiated this past fall. The programs given in the Administration Building auditorium were an overwhelming success. The lecture series will be repeated again in the fall of 1980.

Because of the use of the auditorium for flower shows and other events the lecture series will, for now, be limited to a fall series. Programs held in 1979 included the following programs and speakers:

Plant Hunting in Japan - Dr. John L. Creech
Birds of the Garden - Dr. Carl W. Buchheister
Gardens of Pompeii - Dr. Frederick G. Meyer

Special Items

Employee Improvement Health & Safety. The following films relating to employee health and safety were shown in the Administration Building auditorium to National Arboretum Employees:

1. Herbs - Uses and Tradition
2. Nature's Colors - Craft of Dyeing with Plants
3. Booker T. Washington
4. George Washington Carver

Slide Collection. A concentrated effort continues to be made to photograph plant material commonly used in the landscape in order to assemble a comprehensive set of 35 mm slides to be copied and made available for teaching purposes to other institutions and individuals.

The following slide programs have been assembled in slide carousels for use in talks to various groups, for programs at the Arboretum, and classes taught at the Arboretum by the Curator of Education:

--Plant Propagation
--Pruning Practices
--The U.S. National Arboretum
--National Arboretum Education Programs
--Insect Pests of Landscape Plants
--Diseases of Landscape Plants
--Groundcover Plants
--Broadleafed Evergreens
--Street, Shade and Ornamental Trees
--U.S. National Arboretum Introductions

Three carousels of slides of flowering trees and shrubs have been assembled for use in the class, Landscape Plants for the Greater Washington Area, taught at the Arboretum for members of the Arboretum mailing list.

A concentrated effort is now underway to photograph plants in the following categories for future slide programs:

--Landscape Plants for Fall and Winter Interest
--Hedge and Screen Plants
--Landscaping with Evergreens (Conifers)
--Landscaping with Vines
--Gardening in the Shade
--Attracting Birds to the Garden
--Growing Herbs

Many of the 35 mm slides for the programs have been photographed at other botanical gardens in this country and abroad as well as in private gardens and parks.

Outlines for a text for some of the slide programs is currently in progress.

Training Packets for New Employees. Training packets designed to introduce new employees to the National Arboretumhave been assembled by Mary Ann Jarvis, Program Assistant.

Two orientation tours were held for new employees.

Youth Conservation Corps. Conducted tours of the Arboretum for Youth Conservation Corps members from St. Mary's County, Naval Air Station.

National Capital Area Federation of Garden Clubs. Under a cooperative agreement with NCAFGC, volunteer aids are provided to staff the Information and Activity Center. Daily instruction and orientation concerning collections, programs, and special events at the Arboretum is offered to the volunteers by Mary Ann Jarvis.

Two new postcards featuring bonsai in the National Bonsai Collection are available in the Gift Shop operated by the National Capital Area Federation of Garden Clubs. Photographs for these postcards were provided by the Education Department.

U.S. DEPARTMENT OF AGRICULTURE PUBLICATIONS

The following Program Aids (PA), Agriculture Information Posters (AIP) and Home and Garden Bulletins (HG) were written, revised, received new art work or were reviewed and approved for reprinting without change by Erik A. Neumann.

--HG # 71 - Growing Azaleas and Rhododendrons.
--HG #135 - Growing Flowering Crabapples
--PA #309 - The U.S. National Arboretum
--PA # - The National Herb Garden
--HG #181 - Shrubs, Vines, and Trees for Summer Color
--HG #142 - Shrubs for Shady Areas
--PA #890 - Camellias at the National Arboretum
--PA #491 - Azaleas and Rhododendrons at the National Arboretum
--AIP # 1 - The National Arboretum (Poster revision)

Awards. Received Community Service Award for outstanding leadership in the 1978 Combined Federal Campaign of the National Capital Area. Award given by W. Michael Blumenthal, Secretary of the Treasury, Chairman, 1978 Combined Federal Campaign.

Received a Certificate of Appreciation from the D.C. Cooperative Extension Service for participation in the 1979 Flower and Garden Show's Seminars and Demonstrations held at the D.C. Armory, Washington, D.C.

B. Library

Members of the Library Committee for 1979 were Erik A. Neumann, Frederick G. Meyer, Gene Eisenbeiss, William L. Ackerman, and ex-officio John L. Creech and Ann M. Juneau. Delegates from the National Agricultural Library (NAL) were Deputy Director of Library Services, Wallace G. Olsen, Leila Moran, Chief of Reference Branch, and Jayne MacLean, research librarian, as alternate.

Collection Growth-Purchases. A total of 159 books were purchased with money from the National Agricultural Library's book budget. For the period of January to December of 1979, acquisition expenditures totaled $3,046.

Selections are made by the Library Committee on the basis of their being supportive of research and education conducted at the National Arboretum. Books are ordered and cataloged through NAL and then forwarded to our collection.

Some representative titles we received this year include: Urban Forestry, The Camellia: its history, culture, genetics..., Medicinal Plants of West Africa, Flora Italica, Manual of Site Maintenance, Diseases of Shade Trees, Manual of Dwarf Conifers, Neo-Lineamenta Florae Manshuricae, Agricultural Chemicals, and Organogenesis of Flowers.

Collection Growth-Gifts. Owing to the generosity of many, the library has acquired books it may not have had an opportunity to obtain otherwise. National Arboretum staff members and friends donate books from their own personal libraries or gift monies of their own, or that which have been earned from natural history lectures which they present.

Some titles received in this manner are: Hortus Floridus, The First Book, The Fragrant Garden, Herb Walk, Hortus Third, and the Romance of the Apothecaries Garden at Chelsea.

Of special note are gifts from the following contributors: Mr. Hewlett W. Lewis of Washington, D.C., contributed $2,000 to the library fund as did NAL Associates contribute $500 toward the purchase of a collection of 48 old and rare horticultural books of Mr. Miyoshi Furuse of Japan. In addition, NAL, on behalf of the Ikebana International, Washington, D.C., Chapter No. 1, Inc., presented to the National Arboretum Library, on indefinite loan, a collection of 54 very old and rare books on Ikebana (the art of Japanese flower arranging) and a handsome display case for the housing of these. Earlier in the year, Mrs. Jean Holgate contributed to the Arboretum the valuable, complete 4-volume facsimile Les Roses by P. J. Redoute, on indefinite loan.

Serials. Journal subscriptions for 1979, as previously, were purchased with Arboretum funds. Of the approximate total of 361 subscriptions currently received, the cost of the 90 purchased subscriptions amounted to $1,250.68. The library acquires the remaining subscriptions through donations or exchange with other libraries.

The issuance of the library's "Contents of Current Periodicals" continues to help inform the staff of the pertinent current periodical literature received.

Upon clearance by NAL, we decided to distribute 16 boxes of duplicate journals and incomplete runs of subscriptions we could not utilize to the research facilities of the Food and Agriculture Organization's International Board for Plant Genetic Resources in Iran and Afghanistan.

Travel and Meetings. Travel was restricted to a minimum within the Department this year, however, the number of library-related meetings in Washington, D.C., was substantial enough to keep one involved throughout the year.

The librarian attended:

The National Information Conference and Exposition (NICE), April 28-May 3, 1979, an interdisciplinary approach to new trends and problems in information management.

Agricultural Outlook Conference, November 5-8, 1979, a USDA sponsored meeting on agricultural perspectives. The librarian participated for an afternoon, in providing information at the National Agricultural Library's exhibit of its on-line computerized bibliographic retrieval system.

White House Conference on Libraries and Information Services, November 13-17, 1979, at which lay delegates and professionals met to make resolutions in support of the National Library Act to be enacted by Congress.

Agricultural Information Conference, November 26-28, 1979, sponsored by the National Association of State Universities and Land Grant Colleges in conjunction with Technical Information Systems (NAL) of the USDA. The librarian attended a discussion meeting on November 28.

As a means of acquainting oneself with area institutions related to the Arboretum's research program, the librarian led two one-day field trips to local horticultural centers and museums. Interested staff were invited to attend these trips on which we visited libraries and plant collections.

In September, we visited Dumbarton Oaks and Brookside Botanic Garden. The following month we toured the American Horticultural Society, its Plant Data Resource Center, and the Smithsonian Institute's botanical library and herbarium.

Services. All the traditional library services such as lending, reference, interlibrary loans via NAL's document delivery system, computerized literature searches and general maintenance of the collection is provided by the National Arboretum Library which is a branch of NAL.

Monthly statistics enable us to quantitate and evaluate the extent to which patrons use the library:

Readers	1979	1978
Arboretum	1,126	1,053
Others	255	194
Total	1,381	1,247

Books Requested	1979	1978
Arboretum		
filled requests	525	447
unfilled requests	87	73
Total	612	520
Others		
filled requests	95	--
unfilled requests	13	--
Total	108	--

Reference Questions		
Arboretum	519	460
Others	209	230
Total	728	690

Serving as a current-awareness service for our staff and other institutions and organizations with similar subject interests as ours, the Library distributed nationwide, a New Acquisitions List, semiannually. Our distribution list consists of local public libraries, botanical gardens and horticultural society libraries, USDA field libraries (primarily Forest Service) and university libraries.

The librarian undertook various small projects during the year to enhance accessibility of the collection and to further the dissemination of information of the library holdings at the Arboretum and at NAL.

Rare books that had not been cataloged or that had old NAL call numbers were reclassified into the Library of Congress classification systems.

Also, research was undertaken and bibliographic data was collected for the ensuing bibliographies relating to "specialty herbs,""floras and floristics of the world" and "plant explorations and introductions."

ARBORETUM RESEARCH

A. Nomenclature and Taxonomy of Cultivated Plants (F.G. Meyer and staff)

1. Curatorial Activities in the Herbarium (P.M. Mazzeo)

Upgrading and expansion of the herbarium as a technical resource for support of National Arboretum research programs continues unabated. The herbarium now contains 439,370 specimens of vascular plants and ranks about 20th in size among the 225 herbaria in this country. The Arboretum herbarium is one of three major herbaria in the country that emphasizes cultivated plants to the cultivar level. Many new genus and species covers were added (or replaced) as needed. Additional fruit and bulky materials (roots, stems, etc.) were curated and incorporated into the main herbarium collection. Now all of this material is readily available in systematic order within the herbarium. Much of the curatorial work was accomplished with the aid of Mr. McClammer, Biological Technician in the herbarium.

Major accessions received during the year (71 accessions representing 7,501 specimens) included 902 cancer vouchers (collected by botanists at the Economic Botany Lab, Beltsville, Maryland); more than 450 specimens of cultivated Hawaiian plants as a gift from Mr. W. Bush of Honolulu (including many duplicates to be used for exchange); 2,328 specimens from National Arboretum staff members; 200 specimens of Chilean plants from O. Zollner; 554 specimens from the National Science Museum, Tokyo; more than 700 specimens from the Morton Arboretum, Lisle, Illinois; nearly 400 specimens of plants from Longwood Gardens, Kennett Square, Pennsylvania, and 320 specimens from the Main Botanic Gardens, Moscow, U.S.S.R.

Mr. James U. McClammer, the herbarium assistant for the past two years, resigned in August to enter graduate school at Yale University. As a replacement, Theresa Ayers joined the herbarium staff as Museum Aid at the end of December. The mounting room staff lost one "1040" student appointee, but gained another to fill that slot. In addition, a summer student mounter was added to the staff during the period June-August. During this reporting period the number of Young Adult Conservation Corps (YACC) employees changed from time to time. At present there are two YACC enrollees assisting with the plant mounting. The normal mounting room staff consists of one full-time plant mounter, one "1040" student mounter, and two YACC plant mounters.

Despite the fluctuations in the mounting room staff and the training of new mounters, a record number of 15,455 specimens were mounted and added to the permanent herbarium collection. This figure includes 8,555 specimens from various sources and 6,900 specimens from the Martindale herbarium that were remounted. During the past year a major emphasis has been placed on remounting of the Isaac C. Martindale herbarium, a 19th century collection consisting of about 80,000 specimens purchased in 1964. The Martindale herbarium is especially rich in material from the United States and Europe, but material from many other parts of the world are also represented. The collection also contains many types. The collections from western United

States are especially interesting because many were collected by botanists assigned to the early railroad surveys to the west from the 1850's onward. The collections range from the 1790's through the 19th century up to 1893, when Martindale died. To date, 41,561 Martindale specimens have been incorporated in the main herbarium, or about half of the total collection. Dealing with the Martindale herbarium has been a slow process because the collection must be remounted in its entirety on account of the poor quality paper originally used by Martindale; also many of the original sheets contain more than one collection, and these must be mounted separately. The Martindale collection has been an important acquisition that provides a historic base for the herbarium that recently collected materials could not achieve.

The public use of the herbarium has been greater than normal. During the year 606 miscellaneous specimens were sent from all parts of the country for identification. There was a stream of visitors, students, and specialists and a number of foreign visitors who used the herbarium. Further details are given in the Herbarium Statistical Report.

2. Cultivated Flora Project (F.G. Meyer & P.M. Mazzeo)

This long-range project was initiated in 1968 for purposes of documentation and identification of ornamental trees, shrubs, and woody vines of southeastern United States, from Maryland and Delaware to the northern tier of Florida, to eastern Texas, Arkansas, and Tennessee. To date, field collecting has covered parts of every southern state, except Arkansas. A number of areas, however, have been barely covered. Collections originate mainly from college campuses, cemeteries, private gardens, parks, experiment stations, arboretums, and botanic gardens. This field survey is the first of its kind ever attempted for one large geographic area of the United States. To date, about 6,000 collections have been made. This survey provides (1) an inventory of the woody ornamentals cultivated in southeastern United States; (2) their abundance, and (3) their distribution over this large geographic area. During the year approximately 1,000 specimens of woody ornamentals have been identified and labeled from collections made on behalf of the cultivated flora project.

The documented materials from the survey provide the basis for a book on the cultivated woody plants of southeastern United States, a vast area of the country without a comprehensive reference work on this subject. Writing of the text is now in progress, family by family, including keys for identification, descriptions and source information. The work will be illustrated with drawings and photographs.

Field Work for 1979 -- Cultivated Flora Project

In 1979, just over 300 collections were obtained from twelve sites in Maryland, Virginia, the District of Columbia, and North Carolina.

--Blake Garden, Hillsborough, North Carolina

In her expansive garden on the edge of Hillsborough, North Carolina, Mrs. Charles H. Blake has brought together a valuable collection of heritage or old roses. The collections were obtained from many sources. Roses have been grown continuously in gardens of southeastern United States since colonial times. Many old rose varieties have been lost but a few still exist in old gardens, especially around old farm houses. Mrs. Blake has found several of these old southern garden roses, and names have been found for a few. One of these, Rosa sempervirens, a south European species, long thought lost in the South, has been reidentified by Mrs. Blake. Herbarium specimens and photographs of over 125 species and cultivars of old roses were obtained from the Blake garden.

--Sarah Duke Gardens, Duke University, Durham, North Carolina

The Sarah Duke Gardens are spread over 25 acres on the campus of Duke University. The collections of woody plants are scattered mainly in a loblolly pine woodland setting. The main entrance walk is bordered with a double row of little-leaf lindens (Tilia cordata) then continues past a modern rose garden. At the entrance to the formal garden, a pergola covered with a large wisteria vine (Wisteria sinensis) is flanked by a row of six to seven-foot specimens of English box (Buxus sempervirens 'Suffruticosa'). Beyond the pergola is a series of broad terraces planted with herbaceous materials. In a pine woodland, the H.L. Blomquist garden is devoted to herbaceous and woody species of native North Carolina plants, including Styrax grandiflora and Magnolia virginiana, both in flower during our visit in early May. A fine young specimen of the double-flowered horsechestnut (Aesculus hippocastanum 'Baumannii') has been planted near the rose garden.

--Mount Clare, Baltimore, Maryland

This historic property belonged to Charles Carroll, Barrister, and dates from the middle of the 18th century. Among the many large specimen trees on the grounds are twelve large English elms (Ulmus procera), planted about 1754, the largest of which stands about 90' tall and 76.5" in diameter. All of the English elms are in good condition, so far having escaped Dutch elm disease. Also on the grounds are a large number of red horsechestnuts (Aesculus x carnea) and double horsechestnuts (A. hippocastanum 'Baumannii'). Other notable specimens include English oak (Quercus robur), English maple (Acer campestre), Amur cork-tree (Phellodendron amurense), and southern buckeye (Aesculus octandra). In two trips to the property it was possible to document all of the woody plants on the grounds.

--Campus of Johns Hopkins University, Baltimore, Maryland

The Johns Hopkins campus has been landscaped with considerable skill and taste. The collection of trees and shrubs, although quite diverse, consists mainly of commoner species and cultivars, such as Acer plantanoides 'Schwedleri', Tilia cordata, T. tomentosa, Broussonetia papyrifera, Acer ginnala, Zelkova serrata, Halesia carolina, Cornus florida, and C. kousa. Noted among the

lesser known trees were Calocedrus decurrens, Cryptomeria japonica, and Cercidiphyllum japonicum. Nearly 100 kinds of trees and shrubs were documented on the Johns Hopkins campus.

--William Paca Garden, Annapolis, Maryland

The original house and gardens, dating from the middle of the 18th century, have been immaculately restored within the past ten years. Lacking an original planting plan, the garden has been restored with native eastern American species that could have been grown during the 18th century, such as Carpinus caroliniana, Pieris floribunda, Fothergilla gardeni, Tsuga caroliniana, T. canadensis, Hamamelis vernalis and others. A few exotics grown in 18th century American gardens are also included, such as Vitex agnus-castus and Taxus baccata. Voucher herbarium specimens were prepared for many of the trees and shrubs in the Paca garden.

--Mount Vernon, Virginia

In the autumn of 1784, on a land inspection tour of West Virginia and Pennsylvania, George Washington collected seeds of a red-flowered buckeye at the mouth of the Cheat River at the confluence with the Monongahela River in Green County, Pennsylvania. Nine seeds collected originally by Washington were planted at Mount Vernon and according to Washington's diary all nine seeds germinated. One plant has survived to the present day, now a tree 60' tall with dark red flowers. In 1917, Professor C.S. Sargent of the Arnold Arboretum identified the Mount Vernon specimen as Aesculus pavia, the American red buckeye of coastal plain woodlands of southeastern United States. However, A. pavia never grows to 60' tall and differs in other respects from the tree at Mount Vernon. Doubting that the Mount Vernon specimen could actually represent A. pavia, specimens were sent to Dr. James Hardin, an authority on Aesculus at North Carolina State University at Raleigh. Dr. Hardin identified the material as A. x. hybrida, a cross between the southern buckeye, A. octandra and A. pavia, the red buckeye. This hybrid buckeye was first noticed in Europe in 1813, where it is still cultivated. In the United States A. hybrida is very rare. Outside of the specimen at Mount Vernon and a putative seedling at Woodlawn Plantation near Mount Vernon, material of A. x hybrida would be very difficult to locate in this country. The valuable Mount Vernon tree is being propagated by the National Arboretum for distribution.

3. Ancient Plants of Pompeii and Herculaneum in Italy (F.G. Meyer in collaboration with Professor Wilhelmina F. Jashemski, University of Maryland).

A research report has been completed by Dr. Meyer on the carbonized plant remains recovered from the ancient sites of Pompeii and Herculaneum, both destroyed by the eruption of Mount Vesuvius in A.D. 79. The ancient carbonized plants are represented by grains, nuts, seeds, and fruits, mainly food plants used for human consumption at the time of the eruption. The materials studied include emmer wheat (ancient wheat), barley, broadbean, chick pea, lentil, pine nut, onion, garlic, hazel nut, walnut, cherry, grape, bitter vetch, fig, carob, chestnut, date, common millet, Italian millet, oat,

almond, pear, and crabapple. These archaeological materials are a unique record of the common food plants used by the ancient Romans of the first century A.D. At the same time they leave an indelible record of the history of these plants, all of which are still in use in one form or another.

Additional work in collaboration with Professor Jashemski has been concentrated on the identification of plant remains found in all of the ancient sites destroyed by Vesuvius in A.D. 79, including the plant images found in wall paintings, mosaics, and sculpture, as well as the carbonized materials. The results of this identification work, with due credit, have been incorporated into a recently published book "The Gardens of Pompeii and Herculaneum and the villas destroyed by Vesuvius" by Wilhelmina F. Jashemski (1979).

4. Fuchs herbal project (F.G. Meyer in collaboration with Dr. Emily Trueblood and the Potomac Unit of The Herb Society of America).

The aims of this project have been mentioned before and were detailed in the 1978 annual report. Briefly, the plan is to publish a facsimile edition of the 16th century herbal "De Historia Stirpium" by Leonhart Fuchs, published in 1542. A separate volume of commentary explains the importance and content of this great herbal in the history of botany, including (1) identifications of all 511 plant illustrations in the original Fuchs volume by Dr. Meyer with their modern scientific names; (2) vernacular names of all 511 plants in eight languages; (3) ancient and modern uses of all 511 plant figures; (4) a life of Fuchs; and (5) a bibliography of Fuchs' writings. Portions of the text are now in the hands of the Hunt Institute for Botanical Documentation in Pittsburgh, who will publish the two-volume work.

5. Flora of Staten Island (Argentina) (T.R. Dudley)

"A Contribution to the Flora and Vegetation of Isla de los Estados (Staten Island), Tierra del Fuego, Argentina" has been submitted for publication by the American Geophysical Union. A summary paper titled "Taxonomic and Nomenclatural Notes on the Flora of Isla de los Estados (Staten Island), Tierra del Fuego Argentina" has been submitted for publication and includes a new variety of Armeria, a new interspecific hybrid of Caltha, and four new combinations. Also included in the same paper is a summary checklist of the flora of this island. Another summary paper, based on the botanical exploration of Isla de los Estados is being prepared in Spanish /"Florula de Isla de los Estados (Antártide e Islas de Atlántico Sur) e Bahías Buen Suceso e Valentín (Peninsula Mitre, Isla Grande), Territorio Nacional Tierra del Fuego, República Argentina"/ for publication in the Argentine journal Darwiniana.

6. Viburnum (T.R. Dudley)

Taxonomic and nomenclatural studies on this genus are a continuing long-range project. (1) Two varieties of V. cotinifolium, var. lacei var. nov. from Pakistan and var. wallichii var. nov. from Nepal have been described as new to science and appropriate text material has been prepared for publication; (2) a variant of V. lantana, recently collected in Bulgaria and described as

forma vitosiense forma nova, is distinguished primarily by having yellow fruits. This is the first yellow-fruited segregate of this species to be described; (3) a number of Viburnum taxa new to science from Eastern Asia have been described, some are illustrated, and will soon be submitted for publication. These new plants include: 11 species from mainland China, one species from Burma, one species from Vietnam and Cambodia, one species from mainland China and Vietnam, 23 varieties from China, two varieties from Burma, one variety from Thailand, one variety from Vietnam, one variety from India, one variety from Bhutan, one variety from Assam, one variety from Anatolia, and two forms from mainland China; (4) a systematic account of the Ecuadorian species of Viburnum is being prepared for the Flora of Ecuador; (5) a taxonomic study of V. X hillieri (V. erubescens X V. henryi) is underway, which will compare the cultivated components and the naturally occurring populations of the hybrid and its putative parents as they occur in mainland China; (6) an account of Viburnum for inclusion in the National Arboretum Herbarium project on the Cultivated Woody Flora of the Southeastern United States has been initiated.

7. Conifers (T.R. Dudley)

Failing health and persistent publication problems prompted Dr. J.C. Swartley, author of Eastern Hemlock and its Variations -- With Other Species and Their Cultivars (publication 1980 by Theophrastus-Garland Press), to ask Dr. Dudley to act as technical editor for this monographic work on Tsuga. When published, the book will contain additional material by Dr. Dudley, including comments, notes, appendices, and descriptions of four new cultivars of hemlock: T. canadensis 'Andrews' & 'Feasterville', T. caroliniana 'Elizabeth Swartley', and T. diversifolia 'Gotelli'. In addition, 12 new cultivar names (nomen novum) and 25 previous nomen nudum epithets are validated for the first time at cultivar status by the technical editor.

8. Cruciferae (especially Alyssum and allies) (T.R. Dudley)

(1) A new variant of Alyssum alyssoides with a very depressed growth habit and unusual floral characters was recognized among collections from Spain and described as var. hispanicum var. nov. as new to science; (2) in collaboration with New Zealand colleagues, a study on the hyperaccumulation of nickel by species of Alyssum in Section Odontarrhena was published; (3) a further paper "Uptake of Nickel by Constituent Genera of Old World Tribus Alysseae (Cruciferae)" summarized the phytochemical survey of 18 genera allied to Alyssum. One of the more significant conclusions of this study is that in addition to Alyssum, Buchingera, Bornmuellera and Physoptychis, all indigenous to the Near East, are also heavy metal hyperaccumulators. Outside of the Tribus Alysseae, several species of Peltaria and Thlaspi have been determined to be strong hyperaccumulators; (4) as a result of the chemotaxonomic aspect of nickel hyperaccumulation, correlated with morphological discontinuities, a new species of Alyssum from Portugal has been recognized and described as A. pintodasilvae sp. nov.; (5) in a similar manner several "microtaxa" of the Alyssum serpyllifolium complex, as it occurs in Spain and North Africa, are being critically investigated; (6) the biosystematics of the species of

Alyssum indigenous to Bulgaria are being prepared for publication with the collaboration of Dr. M. Anchev of the Bulgarian Academy of Sciences. This study will utilize trichome configurations and patterns as demonstrated by Scanning Electron Micrographs.

9. Ilex (T.R. Dudley in collaboration with G.K. Eisenbeiss)

Nomenclatural and taxonomic studies of this genus are of a continuing long-term nature. (1) The indigenous hollies of Eastern Europe, Turkey, the Caucasus and Iran have been confused for many years. Some earlier workers regarded I. colchica and I. spinigera merely as synonyms or minor variants of I. aquifolium. The recent discovery of I. colchica in eastern Bulgaria and reconfirmation of this species as the only Ilex element in Turkey and the Georgian Caucasus has lead to a definitive biosystematic-phytogeographical analysis of these three well-delimited species. The results of this study were incorporated into two technical and semi-popular papers; (2) a short semitechnical article is in preparation on a holly from Sumatra with large fruits, one inch long and one inch wide, based on collections in the Herbarium of the Missouri Botanical Garden; (3) the validating descriptions and international registration of Ilex cornuta 'Sam Souder' and I. opaca 'Grace McCutchon' were prepared; (4) Ilex collina is the most recently described holly from North America, dating from 1940. In 1974 it was transferred by another worker to the genus Nemopanthus of the Aquifoliaceae. On the basis of careful floral dissection, hybridization data accumulated at the National Arboretum and anatomical studies, including Scanning Electron Micrographs provided by Dr. P. Baas in Leiden, The Netherlands, it is now clear that I. collina is a true holly, most closely allied to other deciduous species, especially to I. montana, and not to Nemopanthus mucronata. These conclusions are being finalized in a paper titled "A Re-assessment of Ilex collina Alexander (Aquifoliaceae)"; (5) an account of the indigenous Ilex species of Ecuador is underway for publication in the Flora of Ecuador; (6) an account of the Ilex species of Bulgaria (I. colchica and I. aquifolium) is being finalized for inclusion in the new Flora of Bulgaria; (7) for over three decades Ilex centrochinensis and I. ciliospinosa have been confused and misidentified. The reasons for this "identity crisis" and the solutions to the problem are laid out in a paper titled "Ilex ciliospinosa and I. centrochinensis --- A Case of Discordant Elements and Mistaken Identity"; (8) a taxonomic and nomenclatural account of the genus Ilex cultivated in the southeastern United States is in progress for inclusion in the National Arboretum Herbarium project on the Cultivated Woody Flora of Southeastern United States; (9) a checklist of all cultivar names in Ilex crenata is nearing completion for publication as part II of the International Checklist of Cultivated Ilex; (10) data for subsequent parts of this checklist to accommodate all the other cultivated species, hybrids and their cultivars are being compiled; (11) a biosystematic account of the species of Ilex indigenous to the southeastern United States, especially the poorly understood and confused deciduous taxa, is underway.

Dr. Dudley continues a strong and active interest in the Holly Society of America as a trustee, a member of the Research and Development Committee, International Checklist Committee, and International Registration Committee.

He regularly contributes short news and notes items for the Proceedings and Holly Letter of the Holly Society of America. During 1979 he made 30 such contributions.

Other Herbarium Research (T.R. Dudley)

A paper titled "Zoellnera - A New Amaryllid Genus From Chile" is being prepared for publication in Plant Life. The systematics of Rhododendron eriocarpum and R. tamurae continue to be investigated.

10. Malus (R.M. Jefferson)

During 1979, work continued on a crabapple monograph for ornamental and economic crabapple taxa. This monograph will provide nomenclatural and taxonomic data for these plants and discuss their origin and introduction. The preparation of the botanical section, which will include data on about 112 species, varieties and hybrid selections, is nearing completion. Additional data covering over 400 cultivars will also be discussed.

Specimens of mature crabapple fruit, from newly introduced selections, were photographed and collected for herbarium documentation from various taxa grown at the Pennsylvania State University.

Material from 21 verified true-to-name and unnamed crabapple taxa received from the Morton Arboretum were budded and are now established at Glenn Dale. These selections will be moved this spring to the Arboretum's crabapple research nursery for observation and appraisal.

In the spring of 1979 a program was initiated to establish at the Arboretum a research collection of authenticated crabapple selections grown from rooted cuttings. As a means of starting this collection, ten softwood cuttings were taken from each of 15 true-to-name grafted crabapple taxa growing in the Arboretum collection. To date 24 cuttings representing seven cultivars have rooted. These rooted plants, along with others to be rooted later, will be grown for evaluation near grafted trees of the same clone growing on numbered understock selections.

11. Prunus (R.M. Jefferson)

Approximately 30 ornamental cherry taxa were identified as becoming increasingly scarce in the United States, to the point of near extinction. Sources for these scarce taxa were located, and an attempt will be made to establish and maintain this germ plasm at the National Arboretum. In listing locations for this material, four selections were located that possibly have never been distributed in the United States. Three of these are growing at the Glenn Dale Station, Glenn Dale, Maryland, and another is on the grounds of the National Arboretum. All of these cherry selections were introduced into the United States by Paul Russell over 20 years ago.

As a means of avoiding graft incompatability in anticipation of extending the life of true-to-name ornamental cherry selections beyond the

usual 30 years or less, a concentrated effort was made to re-establish these trees on their own roots. One hundred softwood cherry cuttings, representing 16 taxa were successfully rooted during the year.

Additional data was gathered for purposes of a revision of National Arboretum Contribution No. 4, The Japanese Flowering Cherry Trees of Washington, D.C., published in 1977. Over 8,000 copies of this publication were requested during the past year.

12. Trees of Shenandoah National Park (P.M. Mazzeo)

The first edition of Trees of Shenandoah National Park (illustrated), by P.M. Mazzeo, published in 1968, included 114 species, both native and introduced. The apple, tree-of-heaven, hinoki false cypress, Japanese yew and some other introduced trees, occur as remnants around old homesteads that existed before creation of the National Park. The second edition, published in 1979, lists 118 species in the same format as the first edition with most of the same illustrations. A few species were added to the second edition because of increased knowledge of the Park's flora within past years.

HERBARIUM STATISTICAL REPORT

Herbarium Material Received	1978	1979
Number of Accessions of herbarium specimens received from institutions and individuals	60	71
Number of Specimens Received		
As EXCHANGE	2,753	2,802
As PURCHASE	2,580	339
As GIFT (including Staff Coll.)	3,631	4,360
TOTAL Number of Specimens Received	8,964	7,501
Herbarium Specimens Sent		
As EXCHANGE	4,014	0
As GIFT (including specimens for ID)	28	37
TOTAL Number of Specimens Sent	4,042	37

Specimens have been received from or sent to more than 48 institutions in the following countries: Australia, Austria, Brazil, Chile, England, Greece, Japan, Mexico, New Zealand, Pakistan, South Africa, Rhodesia, Turkey, USA, USSR and Venezuela.

Herbarium Material - Borrowed and Sent	1978	1979
Number of loans sent to other institutions	45	19
Number of herbarium specimens sent on loan to other institutions	3,941	2,849
Number of loans from other institutions	53	20
Number of specimens borrowed from other institutions	2,010	3,600

CONTENT OF THE HERBARIUM

	1978	1979
Number of Specimens Added to the Herbarium		
Regular material	12,983	8,555
Martindale herbarium	0	6,900
Total remounted Martindale specimens in herbarium	34,661	41,561
Total material added to herbarium	12,983	15,455
Total number of specimens in herbarium	423,875	439,330
Number of specimens added to type collection	0	88
Number of specimens in type collection	1,652	1,740
Miscellaneous identifications (sent via public, etc.)	484	606
Number of visitors to herbarium	54	66
Number of plant collections made:		
J. McClammer and P.M. Mazzeo	1,700	c. 500
F.G. Meyer	1,800	350
T.R. Dudley		430
T.R. Dudley & G.K. Eisenbeiss	1,600	212

B. Cytogenetics, Breeding, and Evaluation of Landscape Trees (F.S. Santamour, Jr.)

Graft Compatibility - Dr. Santamour has received a research grant from the Horticultural Research Institute, Inc., for a study of "Biochemical and Physiological Aspects of Graft Incompatibility in Woody Landscape Plants". The amount of the grant is $12,000 and it will run from 1979 through 1981.

For many years, grafting (and budding) had usually been thought of simply as a means of propagating, perpetuating, or producing a rare or selected individual plant. With the current increased interest in landscape-tree improvement, grafting may become even more important as a means of uniting selected scion cultivars with rootstocks that have also been selected for important survival traits.

As more scion cultivars are selected in various species and genera and the demand for these "improved" cultivars increases, the problems of graft incompatibility are also increasing. Many of these problems are "latent", in that they appear some years after the plants have left the producing nursery.

At present, the concentration of effort has been on Acer (maple), Quercus (oak), and Ulmus (elm). Preliminary work on other genera has been attempted and also shows promise.

Cambial Activity - From March through November of 1979 we monitored, on a weekly basis, the electrical resistance in the cambial zone of: (1) 384 young trees representing 48 seed sources of green ash (Fraxinus pennsylvanica), (2) 70 maples of known parentage, (3) 10 native trees each of Quercus alba, Liquidambar styraciflua, and Liriodendron tulipifera, (4) 10 grafted trees of 'Bradford' pear, and about 10 cultivars of several other species. This work represented more than 18,000 individual measurements.

Measurements were made with a Shigometer, an instrument that delivers a pulsed electric current through needles or other probes inserted into trees. The instrument was developed originally for the detection of decay in trees, but many researchers are exploring new uses for this tool.

We were interested in finding out whether cambial electrical resistance could be used to measure the initiation and cessation of cambial activity. Such information would be extremely useful in determining the role of cambial activity in grafting studies.

This mass of data has not been completely analyzed but preliminary analyses have shown that: (1) electrical resistance can measure cambial activity, (2) trees from different geographic areas may vary in the duration of cambial activity, (3) electrical resistance is related to inherent growth capacity, and (4) electrical resistance (like growth rate) is a heritable characteristic.

Cambial Isozymes - In Acer, we have developed cambial peroxidase profiles for: (1) 11 cultivars of red and silver maples, (2) 91 red maples from 12 geographic origins, (3) 225 trees representing parents and progenies of known crosses, (4) 108 red maple rootstocks that are budded with two popular cultivars, and (5) over 100 red maple seedlings that will be used as rootstocks for grafting. In Quercus, we have done the same for 177 trees representing 37 different seed sources of 13 species. All of these data have given rise to hypotheses on the influence of peroxidase enzymes on graft compatibility. We will utilize the sprout clumps arising from felled trees of known enzyme constitution to engage in an extensive reciprocal "patch-grafting" study to test these hypotheses.

Performance of interspecific elm grafts made in 1979 conformed well to our hypothesis regarding peroxidase comparability. Observations and additional enzyme work will continue through 1980.

We were also able to distinguish ("fingerprint") six cultivars of Callery pear using peroxidase assays from both cambial and leaf tissue.

We plan to expand the isozyme work to include all cultivated species of Acer and Quercus and perform preliminary analyses on Tilia, Fraxinus, Carpinus, and several other genera.

Wound Response - As mentioned in the 1978 Annual Report, we have shown that the compartmentalization response of trees to stem or trunk wounds was inherited (See "Publications" in this report). We attempted to perform a similar experiment on response to root wounding, but found that the situation in roots was either more complex or simply required more time for expression. Therefore, we have initiated another root wounding study -- the results to be available in 1982!

Root Hardiness - The increased landscape use of trees and shrubs in large, above-ground, outdoor planters has focused increased attention on coldhardiness of the root system as a limiting factor in these situations. We have shown (see "Publications") that root hardiness of green ash, like stem or bud hardiness, depends to a large extent on the native geographic origin of the plant material. If enough planters of large capacity can be obtained by donation or purchase we plan to extend these studies into a comprehensive investigation of the selection and culture of trees in tubs.

Bagworms - Studies on insect resistance of landscape trees are often hampered by an incomplete knowledge of the pest's life cycle and often-erratic behavior patterns. Recent evidence has shown that certain insects "co-evolve" with their individual tree hosts to the extent that, when moved or forced to feed on different genotypes of even the same tree species, their survival and fecundity were lowered significantly. We decided to test this hypothesis with the so-called "evergreen" bagworm, representing a population that had been maintained on a single clone of Leyland cypress for 3 generations. Bagworm larvae were physically transferred to other gymnosperms and angiosperms. The

The bagworms barely paused in their feeding activities on known host species before devouring the foliage in their new surroundings. Some new host plants of bagworm were recorded and some non-host species appeared to "resist" feeding. However, it was conclusively shown that bagworms do not "track" their hosts and that finding resistance within known host species would be chancy at best.

Ilex - Further testing was completed on the nature and incidence and resistance to holly leaf miner that was begun in 1978. Populations of additional interspecific hybrid combinations were used. Hybrids that showed resistance last year were tested again. Approximately 50 different interspecific Ilex crosses were made, some of which had never been attempted before. As expected numerous failures were encountered, but some crosses produced seed. These seed have been harvested and sown. Numerous seedling populations from previous hybridization are being grown and evaluated. Two selections, I. (aquifolium x cornuta) x pernyi and a variegated selection of I. x attenuata 'Foster #2', have been made for introduction, and are in production for distribution to stock increase cooperators. Three species of Ilex new to cultivation in the USA, I. dimorphophylla, and I. poneantha and I. goshiensis from the Ryukyu Islands have been acquired for evaluation for landscape use and potential hybridizing.

Platanus - In the past, we have recreated the "London" plane (P. occidentalis x P. orientalis) and selected four clones that are currently being evaluated by nurserymen throughout the country. However, trees take a long time to grow and the nurseryman must be cautious about the plants he chooses to reproduce vegetatively on a large scale. With this in mind, we decided to produce, en masse, a seed-propagated progeny with high anthracnose resistance and fairly uniform growth characteristics. Therefore, in 1979, we repeated a cross whose progeny has shown good growth and that had no trees with more than 5% wilt during our severe anthracnose years. We have harvested more than 150,000 seed from this cross and will make the seed available to nurserymen who produce large amounts of seedling-grown material.

Quercus - Through the courtesy of Longwood Gardens we have been utilizing their Michaux Quercetum oak planting for various studies in the past year. We have felled 185 trees and typed these for isozymes and will be patch-grafting on the sprout clumps. We also have stem-and root-wounding experiments in this planting and personnel of the Morris Arboretum, cooperating with us, have monitored cambial electrical resistance through the summer of 1979.

The Michaux Quercetum was begun in 1953 as a joint effort between the U.S. Forest Service and the Morris Arboretum. One of the objectives of the study was to provide information about the variation within major oak species. The plantings at Longwood were made in 1957 and 1958 and contained more than 2000 trees of 15 oak species from various geographic origins. The trees were 25 years old (from seed) at the end of the 1978 growing season.

We measured the heights and diameters of all trees before (or during) other research activities and have prepared a manuscript on the 25-year growth performance of these trees. The Longwood planting is probably the oldest and most extensive collection of oak provenances in the world, and the results of this study should prove enlightening to nurserymen and arborists.

Another oak study is also nearing completion. In 1976, Dr. Santamour received a modest grant from the Horticultural Research Institute to assist in the evaluation of an oak hybridization project being carried out by Dr. Walter Cottam at the University of Utah. This project has produced more bona fide interspecific oak hybrids than any other, including those in Russia. The report will be published as a separate early in 1980.

Special Items

Mr. Eisenbeiss and Mr. Frank Grant were certified as pesticide applicators in the District of Columbia. Mr. Eisenbeiss attended the annual meeting of the Holly Society of America in St. Louis, Missouri, October 30 to November 3, 1979 and presented several reports. He also gave lectures on holly to the National Capital Area Federated Garden Clubs of America and to the National Arboretum Volunteer Guides.

Dr. Santamour served as organizer and program chairman at the Metropolitan Tree Improvement Alliance meeting in Cleveland, Ohio in October, 1979. He also presented the banquet address at a symposium on "Dendrology in the Eastern Deciduous Forest Biome" held in Blacksburg, Virginia in September. Dr. Santamour was elected President of the Mid-Atlantic Chapter of the International Society of Arboriculture. He also served on the Grant Awards panel for the U.S. Forest Service's Consortium for Urban Forestry Research.

C. Cytogenetics, Breeding, and Evaluation of Ornamental Shrubs (D. R. Egolf)

The shrub breeding research facilities have been improved and renovated to increase production and promote efficiency. The five plastic greenhouses, 27' x 96', were made operational with the installation of a copper overhead irrigation system for liquid fertilization in all units and a fan jet-gas heater system in the last two units erected. In the research greenhouse four humidifiers and four Alpine air coolers were installed in two sections. A planting bed, 18' x 96', with concrete block retaining walls was constructed adjacent to the plastic greenhouses. The irrigation lines in the crapemyrtle nursery were renovated, and an additional line with ground level hose bibbs installed. The old Pyracantha-Viburnum nursery of approximately 5 acres has been cleared and a new 3-inch water main and 2-inch trunk lines installed in preparation for lilac planting. A half acre to the rear of the lath house has been cleared and rough graded in preparation for drain field and irrigation system installation prior to the establishment of container and seed bed production area.

Abelia - Currently 9 Abelia accessions representing 6 species and 3 cultivars are being maintained as stock plants for hybridization. In the initial hybridization attempts, 12 crosses were made which failed to produce seed, possibly due to the heat of summer. The stock plants are container grown and will be forced for hybridization early next season.

Hibiscus - A triploid Hibiscus which does not produce abundant seed but flowers over a long season will be introduced next year. This selection has compact growth habit; heavy, dark green leaves; and firm-textured, wide-spreading, ruffled, white with dark red eyespot flowers. The plant in 7 years has grown to a height of 6 feet and a width of 5 feet. The dense branching, combined with compact growth habit and free flowering throughout the summer, provides a choice landscape shrub.

Lagerstroemia - Flowering of Lagerstroemia was delayed by cooler temperatures in the early summer, but the late flowering was profuse. Because of abundant rain maximum plant growth was achieved without irrigation. The 1,600 L. indica x L. fauriei selections in the field evaluation were highly mildew tolerant; whereas, all of the L. indica plants were heavily infected with mildew due to the ideal conditions of temperature and moisture that persisted for much of the growing season. An additional 585 selections were made from seedling populations and will be field planted next season. Initial propagations of 35 second and third generation L. indica x L. fauriei selections were made for future distribution to evaluation cooperators for critical appraisal under diverse soil and climatic conditions.

The major hybridization emphasis was with the dwarf mildew tolerant L. indica x L. fauriei selections in order to produce more compact growth habits, clear colored flowers that bloom over a longer period, and increased mildew tolerance. Of the 116 crosses made, 88 produced 26,431 seed which

were immediately sown. As increased mildew tolerance is achieved with each generation, the horticultural characteristics gain significance in seedling evaluation.

'Muskogee' and 'Natchez', each of which was increased during the year to more than 50,000 plants by stock increase cooperators, have been introduced. L. x 'Muskogee', a seedling of L. indica x L. fauriei, is a multiple-stemmed large shrub or small tree. In 11 years the original plant has grown to a height of 24 feet and breadth of 12 feet. The exfoliating, medium brown (164B-165D Greyed Orange) bark is spectacular throughout the year. Under field conditions the 6.9 cm. long and 4 cm. wide, heavy, dark green leaves have been mildew resistant. The autumn foliage turns good reds and yellows. The light lavender (Violet 84C) flowers open in early August and continue with scattered recurrent bloom. The plant may be grown single or multiple-stemmed, and is adaptable for specimen or street tree planting. The plant is hardy in Zone 7b.

L. x 'Natchez', a seedling of L. indica x L. fauriei, is a multiple-stemmed large shrub or small tree. The plant in 11 years has grown to a height of 22 feet and width of 12 feet. The exfoliating, dark brown (166B-174D Greyed Orange) bark of the trunks is more spectacular than that of the parent species, L. fauriei. The trunk characteristics alone warrant growing this plant. The 6-8 cm. long and 3-4 cm. wide, glossy, dark green leaves have been resistant to mildew under field conditions. Abundant white flowers are produced in early July and recurrent bloom continues for more than two months. This plant, grown either as single- or multiple-stemmed, is destined to become a major landscape item for specimen or street tree planting. The plant is hardy to Zone 7b.

The third L. indica x L. fauriei selection, with coral flowers, light brown bark, glossy leaves, and high mildew tolerance, is being increased in even greater numbers than 'Muskogee' and 'Natchez' for introduction in 1980.

Malus - From the 40,646 Malus seedlings raised in 1972-73, 1,010 disease free plants were isolated after controlled fire blight inoculation and were field planted. In 1978 a number of these flowered, and in 1979 flowering and fruiting were extremely heavy. In addition to the 16 selections made in 1978, another 138 selections that combine disease tolerance with desirable flowering, fruiting, and growth habit characteristics were made this season for further evaluation. Initial propagation of a limited number of the superior selections will be undertaken next season for field testing at other sites by cooperators.

During the year the Malus research plant collection was increased by eight accessions that represent six species and two cultivars.

Hybridization was undertaken in an attempt to combine the horticultural characteristics of small stature, flower color, small fruit, heat tolerance, and heavy, glossy leaves with fire blight, scab, cedar-apple rust, and mildew resistance. Of the 153 crosses made between 27 female and 24 male

parental clones, 132 crosses set fruit that produced 12,196 seed. A number of the parental plants used in hybridization are seedling selections with high disease tolerance.

Prunus -- (Ornamental Cherries)

Prunus - The genus Prunus includes an array of species with diversity of disease tolerance, flower form and color, season of bloom, growth habit, and hardiness characteristics which have not been exploited to produce superior disease free cultivars in a breeding program. Because of the multitude of cultural and disease problems with the flowering cherries it is necessary to survey the available germplasm prior to extensive hybridization. In order to evaluate the genetic variability of select species and authentic species hybrids, 20 seedling populations comprised of 3,500 plants are being grown for critical appraisal. Elite plants isolated from these populations will provide the parental stocks for comprehensive hybridization. Next season initial crosses will be made with select species using pollen from other collections and plants maintained at the Plant Introduction Station, Glenn Dale, Maryland.

Pyracantha - 'Navaho' and 'Teton', the two cultivars introduced last year, have been highly acclaimed by both the domestic and the foreign wholesale nursery industry. Not only have these cultivars been publicized in a continuing number of nursery catalogs, magazines, and newspaper articles; but also they have been featured as color covers for nursery catalogs and in a brochure published in English, German, and French. In one year after introduction, 'Navaho' and 'Teton' have achieved extensive wholesale and limited retail distribution. After another nursery production year both cultivars should be in sufficient quantity to be readily available through retail outlets.

Extensive hybridization was pursued with the objective to combine fire blight and scab disease tolerance with compact growth habit, abundant fruiting, and cold hardiness. Of the 120 crosses attempted between 8 female and 35 male parental clones, a total of 107 crosses set fruit that yielded 18,319 seed. Twenty of these successful crosses had Malus or Stranvaesia as the male parent. From earlier intergeneric crosses, 21 seed lots representing 10 Pyracantha cultivars, 1 Amelanchier, 1 Cotoneaster, and 7 Malus parental stocks were harvested and sown.

The Pyracantha research plant collection was increased by 3 cultivar accessions. An additional 26 seedling selections were made from advanced seedling populations. Three superior selections were initially propagated for a future distribution to evaluation cooperators.

Syringa - The major thrust of Syringa research continues to be the production of mildew free, compact growth, and abundant flowering plants. The 2,860 seedlings from 1977 crosses, which were planted in beds in plastic greenhouses, have made excellent growth and a portion of these are expected to flower next spring. From the 117 crosses that produced seed in 1978, 1,898 seedlings have been obtained. Although many of these had mildew free foliage under normal greenhouse conditions, most of the plants were

susceptible in varying degrees under controlled temperature and moisture conditions. Of the 40 plants isolated as highly mildew tolerant only three were mildew free. These several resistant plants might prove to be the long sought germplasm for future intensive hybridization. Of the 141 attempted crosses between S. oblata, and select S. x hyacinthiflora and S. vulgaris, 93 crosses have produced 8,817 seed. During the year 75 Syringa accessions, which were procured from Russia, Poland, China, Canada, and domestic sources, were added to the germplasm collection.

Viburnum - Viburnum plicatum var. tomentosum 'Shasta' has been enthusiastically received by nurserymen and has received noteworthy publicity in garden columns and feature articles. 'Shasta' has to date been listed in few catalogs, but photographs and detailed descriptions have been provided for catalog illustration and publicity during the next season. Likewise, there has been significant increased inquiry and requests for the 11 previously released cultivars which are now becoming known and available in limited retail outlets.

A selection with V. carlesii flower type, glossy dark green leaves and compact growth habit, will be introduced next season. A second selection, which is being stock increased, will not be released before at least 2 years. Four additional seedling selections were made for further propagation and evaluation.

Hybridization concentrated on selections from advanced seedling populations with compact growth habit; glossy, dark green, disease resistant foliage; and abundant flowering. From 28 crosses between five female and nine male parental stocks, 21 crosses produced 5,800 seed. In addition, seven seed lots from interspecific crosses were harvested and sown.

Cooperative Program

The evaluation and stock increase cooperative programs expedite the new cultivar introductions that originate from the research projects. As the program has evolved, the number of cooperators is constantly changing. A number of the cooperators consistently provide reports on the number of plants propagated or specific data on selection responses to test conditions; and they are to be highly commended for services rendered. However, of necessity the less responsive and productive cooperators are eliminated to allow for cooperator additions in other geographic areas. In 1979, 783 plants and 200 buds of four selections (Azalea, Magnolia, and 2 Viburnums) were distributed to 19 stock increase cooperators; and 146 plants of six selections (4 Ilex and 2 Malus) and seed of one Betula selection were distributed to 11 cooperators for evaluation.

D. Breeding and Cytogenetics of Woody and Herbaceous Ornamentals (W. L. Ackerman)

1. Camellia

a. Cold Hardiness Project. During the 1978-79 season, 2,830 controlled crosses were made involving C. oleifera with C. sasanqua and C. hiemalis, sib-crosses among F_1 hybrids, and backcrosses with parental species which resulted in 1,350 progeny. These fall-blooming forms will undergo preliminary screening by programmed cold chamber procedures provided suitable equipment becomes available. Otherwise, a long range field testing program will be developed. Crosses among C. japonica 'Frost Queen,' 'Variety Z,' 'Leucantha,' etc. resulted in 210 progeny for similar cold hardiness evaluation of spring-flowering forms. Preliminary utilization of several fertile cultivars of C. vernalis indicate this species has potential as a hybridizing bridge between C. japonica and C. sasanqua. This could prove a valuable tool to transfer cold-hardiness germ plasm from C. oleifera to C. japonica hybrids. Interhybridization of C. oleifera-vernalis-hiemalis-sasanqua with 'Frost Queen,' 'Variety Z,' and 'Leucantha' could then be used to accumulate genes for greater cold hardiness into multi-interspecific hybrids.

b. Heat-Tolerance Project. Evaluation of hybrids of species introduced from tropical and subtropical Asia for their heat tolerance potential. Evaluation returns from six cooperators in southern Florida (in areas where C. japonica does not grow well) show considerable promise. This is part of our program to expand the growing area of Camellias southward beyond its present limits. Interest among American Camellia Society members has resulted in a number of requests to expand the program.

c. Floral Fragrance Project. Breeding and evaluation of fragrant flowered hybrids is continuing at a reduced rate due to our greater emphasis on cold hardiness.

d. Pollen Size and Variability Studies as related to chromosome number provided valuable insights regarding speciation in Camellia. This study has identified several species in our collection as functional hybrids. Using the new pollen data compiled in 1979, additional species and hybrids will be studied to develop a better understanding of speciation relationship in Camellia.

2. Iris (primarily I. kaempferi)

Intra- and interspecific hybridization as a means of developing new floral forms and colors, extending the blossoming season, the longevity of individual flowers, and development of dwarf and short-stem forms. Specifically:

a. A new field plot (D-4) was planted with 1,500 hybrid plants during 1979 for flower evaluation in 1980-81.

b. A number of selections along breeding objective lines have been propagated for final evaluation prior to distribution to nurserymen for stock increase.

c. During the 1979 season, 830 intraspecific crosses resulted in 316 seed capsules, and 370 interspecific crosses resulted in 50 seed capsules. Representative seed from both groups were sown resulting in 1,150 intraspecific hybrid and 256 interspecific hybrid plants growing on in the greenhouse.

d. Progress has been made in the development of a tissue culture propagation system for Iris kaempferi in that plantlets have been successfully regenerated from flower pedicel sections. However, the growth regulator requirements need to be further defined in order to make mass propagation feasible by this method.

3. Amaryllids (Margot Williams)

Lycoris

a. Tissue cultures have now been maintained for over two years in the case of Lycoris albiflora, and one and one-half years for L. squamigera. It has been possible to keep the cultures in active callus production and plantlet formation by manipulating the culture media. Tissue culture work with these plants was written up and accepted for publication in Plant Life.

b. In an associated project, in vitro colchicine treatments of tissue culture-derived plantlets of L. albiflora have resulted in a population of seven plants with varying foliage characteristics suggesting colchicine influence. These are now reaching a size where root tip chromosome counts can be made.

c. Interspecific breeding work was continued. Two hybrids from crosses made in 1977 flowered for the first time in 1979. This represented a shortening of the generation time in Lycoris, usually reported as ranging from four to ten years or more. This shortening of generation time was accomplished by a modified germination and culture technique which greatly increased plant growth. The technique was written up and accepted for publication in Plant Life.

d. Chromosome counts of hybrid Lycoris seedlings resulting from crosses made in previous years verified hybridity.

e. Colchicine treatment in vivo: Colchicine treatments utilizing bulb scale sections of Lycoris albiflora, L. squamigera, and L. X jacksoniana were made. To date, several of the resulting plants show signs of colchicine-influenced changes.

f. A new Lycoris received from the Peoples Republic of China, L. anhweiensis Hsu et Fan, is unknown in Western botanical literature and apparently represents a recently discovered species. A chromosome count was made, indicating that the species had a somatic chromosome number of 2n = 16.

4. Other Amaryllids

The rain lily (Zephyranthes, Cooperia, and Habranthus) collection was increased. A number of interspecific and intergeneric crosses were made, resulting in several capsules with viable seed. A hybrid made in 1977 between Z. tubispatha var. texanus and a pink-flowered form believed to be Habranthus robustus flowered for the first time in 1979. Preliminary cold-hardiness data indicates that Z. tubispatha var. texanus is quite cold-hardy in this area, and further trials will be conducted.

Hippeastrum

Greenhouse experience with species and hybrids indicates that glaucous-leaved types have potential for resistance to infection by Stagonospora fungus. Seedlings resulting from crosses between glabrous and glaucous-leaved types have indicated that the glaucous character is recessive and several hybrid generations will be necessary to produce a broad range of floral characters with glaucous leaves. A self-sterility study has been initiated with Hippeastrum species in an effort to determine the mechanism involved. A brief description of the project was accepted for publication in the Bulletin of the Amaryllis Research Institute, Inc. Initial observations suggest that there is a correlation between natural polyploidy and self-fertility.

Cytological investigations of Paramongaia weberbaueri and Pamianthe peruviana indicate that these two plants have the same chromosome number ($2n = 46$) and are similar enough in karyotype to suggest that they may be cross-compatible, a hypothesis which will be tested when Pamianthe comes into flower.

5. Rhododendron japonicum

Development of a simple technique for separating young seedlings for potential flower color by pigmentation differences in dormant budscales and senescent leaves.

6. Pyrus - Malus

Increased requests for scions of Pyrus calleryana 'Whitehouse' from nurserymen who have heard of the release of this new cultivar. Propagation by budding of 250 pear stocks to a promising Callery pear selection for scion wood in anticipation of naming and release in 1981.

7. Yucca

Self-and cross-pollinations were made with two Yucca introductions resulting in a progeny of 360 seedlings. These are being greenhouse grown for later field testing and evaluation.

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